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The Right Combination

A GUIDE TO FOOD AND NUTRITION

Elizabeth Chant Robertson

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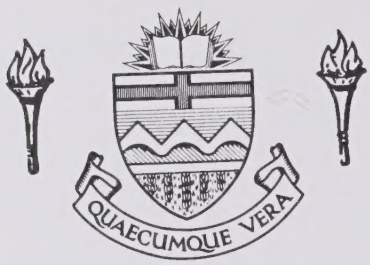

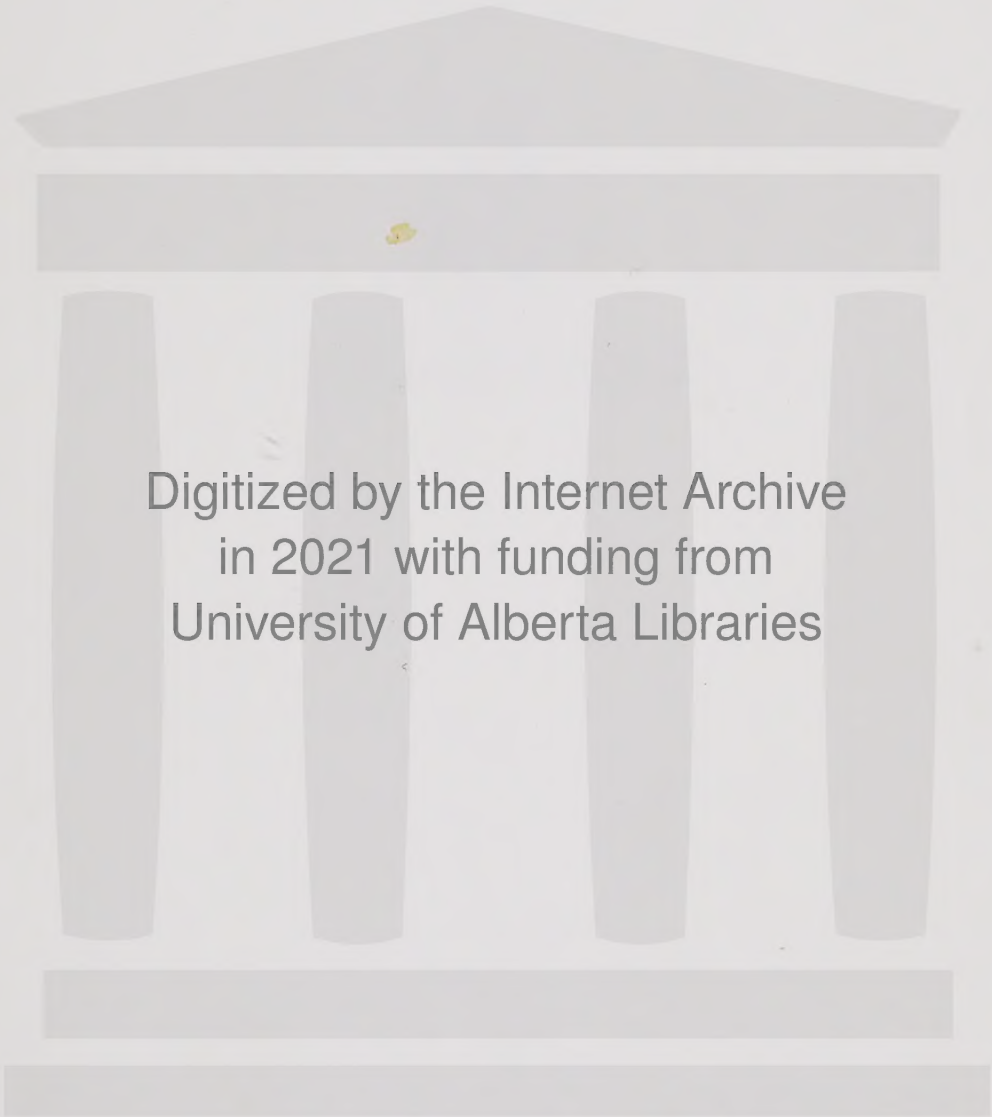
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A GUIDE TO FOOD AND NUTRITION

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Gage Educational Publishing Limited
Toronto

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DEDICATION

To Gladys Martin, Donna Ireland, and the Food Services staff, The Hospital for Sick Children, Toronto

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✹ *"Nutrition has a strong impact on our health and life in general. It affects both physical and mental development, susceptibility to disease and ability to resist infections and tolerate stress. In setting nutrition priorities, it is fundamental to recognize the right of every Canadian to be well nourished. Government policies, industry's actions and consumer attitudes should be geared towards the fulfilment of this right."*

CANADA'S FOOD GUIDE

'Canada's Food Guide' is a plan for the whole day's meals. Average servings of the suggested foods supply all the nutrients needed by the body for growth, repair, energy, and efficient functioning. The 'Guide' does not restrict choice of foods; meals and snacks can be as varied as one likes. More of some foods than others may be eaten; the total amount of food needed will vary with one's size and activity.

The 'Guide's' recommendations can be met while still keeping costs down.

CANADA'S FOOD GUIDE

MILK

Children (up to about 11 years) 2 1/2 cups (20 fl. oz.)

Adolescents 4 cups (32 fl. oz.)

Adults 1 1/2 cups (12 fl. oz.)

Expectant and nursing mothers 4 cups (32 fl. oz.)

FRUIT

Two servings of fruit or juice, including a satisfactory source of Vitamin C (ascorbic acid) such as oranges, tomatoes, vitaminized apple juice.

VEGETABLES

One serving of potatoes.

Two servings of other vegetables, preferably yellow or green and often raw.

BREAD AND CEREALS

Bread (with butter or fortified margarine).

One serving of whole grain cereal.

MEAT AND FISH

One serving of meat, fish or poultry.

Eat liver occasionally.

Eggs, cheese, dried beans or peas, may be used in place of meat.

In addition, eggs and cheese each at least three times a week.

VITAMIN D

400 International Units, for all growing persons and expectant and nursing mothers.

✹ Wherever this symbol appears, the marginal note is from *Nutrition Canada — A National Survey* and is reproduced by permission of Information Canada.

FOREWORD

Would you like to spend your life eating a dozen bars of concentrated food washed down with water each day? The bars could be flavored artificially so that they tasted like bacon, chicken, fruit, or other popular foods. No doubt modern chemists could put in the bars enough of the forty or so essential substances that they know you need each day to keep your body functioning, growing, and in good repair. However, there are probably some substances about which they do not know and there is always the possibility that during the chemical processing, some would be lost.

One day of concentrated food would be an adventure, but the sensory appeal of food would be missing. Food means much more to us than just nourishment for our bodies.

EATING: A SOCIABLE HABIT

Most of us enjoy eating with other people. As you probably have noticed, a healthy young baby eats food eagerly and looks very content when comfortably full. Because babies cannot feed themselves for quite some time, they become used to sharing their meals with others. At all stages of life, we show interest in our friends by eating snacks and meals with them. Elderly people who live alone often lose their interest in food because they no longer have anyone with whom to eat; sometimes, familiar personalities on television or radio programs provide them with some welcome company at mealtime.

DEVELOPING FOOD PREFERENCES

We are not born with an instinct that tells us what we should eat. In fact, many tame animals, such as laboratory rats, do not choose the right foods when they are offered a choice.

A child needs to be encouraged, patiently and ingeniously, to eat a wide variety of suitable foods. This is more easily done with some children than with others. Many people give up trying when a child refuses one food after another. By gradually introducing small quantities of suitable new foods, one can teach a baby to accept various tastes. Often in the second or third year, a toddler begins to show definite food preferences. Food habits that last for years – even for life, are often developed in early childhood.

INCREASING MENU VARIETY

Nearly all of our celebrations and holidays feature food, often emphasizing certain kinds of foods. People from different nations, different parts of the country, and even different families, prefer different foods for these special occasions; serving their specialties in food is one of the ways these people can preserve their identities. Because people from so many countries have now become Canadians, we have adopted many of their special dishes, such as Southern fried chicken, lasagna, and

cabbage rolls. Thus, Canadian menus have become more varied and interesting.

You could call some people experimental eaters – they like to try the new foods that appear frequently on the supermarket shelves and they enjoy visiting restaurants that serve Chinese, Italian, Hungarian, or other national dishes. They are apt to enjoy travelling, partly because it gives them a chance to choose the local specialties. Often these inquisitive eaters will invent their own recipes. Other people are conservative eaters. When they eat out or travel, they try to find a restaurant where they can buy meals like the ones they have at home.

CHANGING FOOD PATTERNS

Pioneering farm families had a real struggle, at least for their first few years, to raise enough food to last them throughout the year. If there were a mill close enough, the miller would convert some of the home-grown wheat into flour and animal feed. Often the miller would keep some of the wheat as payment for services. If you had been one of the family, you would have enjoyed home-baked bread, thick bean soup, oatmeal porridge, raspberry jam, and other staples but you would have missed the wide variety of fresh, frozen, and canned fruits, vegetables and meat that you now enjoy.

Partly because so many women now have full or part-time jobs outside of their homes, manufacturers have developed a great variety of time-saving convenience foods. As some of these do not taste quite as good and are not quite as nutritious as their home-produced equivalents, there still is a place for skill in the kitchen as well as for skill in shopping. Besides, it is worthwhile to know how to produce appetizing and flavorful meals that still provide all the nutrients essential for good health.

But, with all the modern developments, are we eating better meals? In North America, recent reports have been disappointing. Trained workers have studied the eating habits of large numbers of typical individuals and families at intervals over the past thirty years. When they compared the figures obtained in 1965 with those of 1955, they found that, in 1965, definitely fewer people were eating good meals. What was the difference? In 1965, people were consuming less fruit, fewer vegetables, less milk, and eating more of the very sweet foods, often as snacks, than they had ten years earlier. The results of the recent *Nutrition Canada* survey indicate findings similar to earlier provincial surveys, namely that many adolescents, girls especially, have adopted poor eating habits.

"Per capita food consumption data indicate that eating patterns have changed since 1949. The consumption of cereals and dairy products has declined while that of meat and poultry, and fats and oils (excluding butter), has increased."

"The food industry in Canada is technologically advanced and highly diversified as in any developed country.

In 1970, there were 5,778 establishments in Canada with food and beverage factory sales of $8.6 billion. The food industry employed a total of 221,764 persons in 1970. More than half of the establishments are located in Ontario and Quebec.

The types of establishments include meat processing, poultry processing, fish products industry, dairy factories, fruit and vegetable canneries, milling and baking industries, confectionery manufacturers, miscellaneous food industries such as breakfast cereals, food and drink powders, alimentary pastes, coffee and tea, sugar processors, vegetable oil mills, soft drink manufacturers, distilleries, and breweries."

PROTECTING HEALTH

The kind and the amount of food you eat does affect your health, especially when you are growing. Aside from expectant or breast-feeding mothers, no other group of people needs as much of several of the essential food substances, that is, nutrients, in their foods, as do adolescents.

The Canadian Council on Nutrition has produced a table called 'The Canadian Dietary Standard.' In this table are listed the daily amounts of the various nutrients considered suitable for Canadians of all ages and sexes.

This symbol indicates that the marginal note refers to activities, incidents, and conditions in Canada.

Of course, many other factors affect your health too. Plenty of sleep, physical activity, fresh air, and sunshine, all have beneficial affects. So, too, have the modern methods of immunization against a number of infectious diseases and the prevention of milk-borne diseases by the pasteurization, drying, or canning of milk. The chlorination or boiling of water protects you from several other diseases, such as typhoid fever; the fluoridation of water greatly reduces tooth decay. All of these protections are entirely harmless and very effective.

PLANNING MEALS

The way you choose, store, and cook foods can make quite a difference to their health value and, if cooked properly, foods also taste better and look more appetizing. A certain amount of knowledge will also help you to get good value for your money when you shop.

No matter what kind of work you eventually choose, it will be an advantage to know how to produce good meals and that includes the planning and the shopping as well as the cooking. Especially during the early years of marriage, when family incomes are often low, it is a great advantage for both parents to know how to feed their family economically but, nevertheless, well.

Today, with both parents often working outside the home, it would seem reasonable that they both share the homemaking jobs, with help from their children, according to their ages. Everyone, then, can benefit from learning more about nutritionally sound meal planning and preparation.

Elizabeth Chant Robertson

● *"Many of the current nutrition problems can be significantly reduced if the consumer's level of knowledge and motivation leads to a wiser selection of foods and better eating practices."*

Section 1

Nutrients

FOOD AS THE SOURCE OF ENERGY

THE BODY AS A FACTORY

The body is made of billions of tiny cells. Each cell is a minute chemical factory that must be supplied with energy to do its work or to exist.

A paper mill can prove a good example of a factory. Many different materials are needed to build the paper mill; many different substances in food are essential to build the body. After careful planning, skilled workers build the factory; the body builds itself automatically if one eats enough suitable food. The body is also capable of servicing itself and of replacing lost parts, such as the outer layers of skin, without any conscious thought on its owner's part and without any interruption in bodily functioning. On the other hand, if a piece of machinery breaks down in the mill, production stops until repairs are made. The paper-making plant must be provided with a source of energy – water power, for example, to run its electric generators; the body also obtains its needed energy from food.

The mill grinds up the right kinds of logs, processes the resulting pulp with chemicals and water and, finally, produces rolls of paper. This is a violent, noisy series of operations with only one product, paper, as end result. In the body, food is ground with teeth and then further split into smaller fragments by a series of fast but gentle chemical changes in the digestive tract. These fragments enter the blood stream and, within a few hours, some of them have already been built into parts of the body. In other words, many different substances can be produced from food.

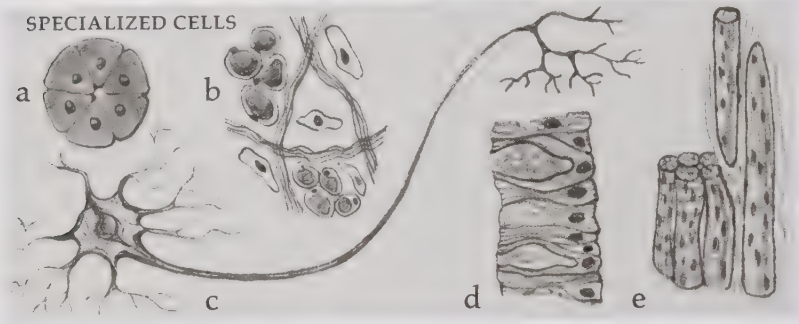
Of course, the machines in a factory cannot grow in size to meet increasing demands as do the muscles and organs. However, factory machines can be turned off when they are not needed, thus conserving energy. On the contrary, the machinery of the human body can never be turned off and so it must be constantly supplied with energy in the form of food, which fortunately can be stored in the body.

The need for food energy begins with the fertilized ovum stage. Originally, each person is just one cell, the fertilized ovum or egg in the mother's uterus. Supplied with simple substances derived from the mother's food, this cell grows very quickly and then divides into two. Each of these two cells also grows quickly and, again, each soon divides into two. This process continues at a rapid rate and, within a short time, the cells change to become muscle cells, nerve cells, and many other kinds of specialized cells. By the end of only nine months, a perfectly formed baby is ready to be born.

Food Energy is necessary:

- ☐ *to keep internal organs working*
- ☐ *for moving muscles*
- ☐ *for keeping the body warm*
- ☐ *for body growth and maintenance*

Successive divisions of one cell, a fertilized ovum, occur shortly after fertilization.



Specialized cells: (e) voluntary muscle cells; (d) cells lining the nose (globlet cells containing mucus); (c) nerve cell; (a) six salivary gland cells; (b) connective tissue and fat cells.

The Nutrients in Food

From their taste and their appearance, one might suppose that such foods as milk, bread, and peanuts were made of entirely different kinds of substances. However, scientists have proved that nearly all the weight of these foods is made up of only four kinds of substances – water, carbohydrates, fats, and proteins. Most foods contain these four substances although the proportions of them vary greatly; few foods provide only one of these four. Various amounts of many different minerals and vitamins make up the rest of the weight in food. Since they weigh little, the vitamins were not discovered until the early 1900's. These six essential substances (water, carbohydrates, fats, proteins, minerals, vitamins) are called nutrients, a term which means "nourishing materials."

One hundred grams is 3 1/2 ounces. By dividing the amount of a nutrient per 100 grams by 2/7, one can find the amount of that nutrient in one ounce.

Food serves the body in three essential ways. It provides us with the energy needed constantly by every body cell. It supplies the building materials needed for growth, renewal, replacement, and repair of the body. It also supplies the materials from which essential body controlling substances can be made. Many of these controlling substances are enzymes and a fair number are hormones. Enzymes are special proteins and the function of each one is to make a particular chemical change or reaction occur more easily. In every body cell, there are at least five hundred different enzymes. Hormones are often called chemical messengers. They are made in certain organs in the body but, as they are carried by the blood, they affect many other parts of the body as well. Each hormone is different from any other hormone, both in its

chemical formula, or composition, and in its effect upon the body.

There is, obviously, some overlapping in the division of the nutrients into these three functions. All six nutrients, for example, are essential for building and for making controlling substances. Although proteins are absolutely necessary for building, if one eats more of them than one needs for all these jobs, the surplus can be used as a source of energy. Minerals are used both for building and for control. Fats and carbohydrates contribute to all three functions.

Three points are quite definite: (1) only carbohydrates, fats, and proteins can be used by the body as sources of energy; (2) this energy cannot be produced unless the food eaten also provides enough water, minerals, and vitamins; and, (3) growth, renewal, replacement, or repair of any part of the body cannot take place without proteins.

THE LIFE CYCLE

If it were not for the plants and the sun, there would be no food. Because plants contain green chlorophyll, they can use carbon dioxide from the air and water from the soil to make glucose, a simple kind of sugar, a carbohydrate. Plants obtain the energy they need to do this from sunlight. In addition, they can combine a great many units or molecules of glucose together to form starch, another carbohydrate. The starch is stored in plant seeds, as in kernels of grain, or in the thickened parts of plant roots, as in beets. The natural covering and framework of plants is another carbohydrate called cellulose, and it, too, is made of many glucose units joined together in chemical union. Plants can also make fats and vitamins and they obtain minerals from the soil.

Plants can even make proteins, which are composed of a great many building blocks, called amino acids, joined together. To do this, the plants use water and simple inorganic substances containing nitrogen from the soil and carbon dioxide from the air. If organic fertilizers containing nitrogen

such as manure or compost are used, bacteria normally present in the soil have to convert these into inorganic compounds since plants can only use them in that form. Chemical fertilizers, on the other hand, are inorganic and do not need to be changed by soil bacteria.

Animals eat these plant proteins and break them up in their digestive canals into their component amino acids. Carried by the blood to the cells, the amino acids are then used to build many different animal proteins.

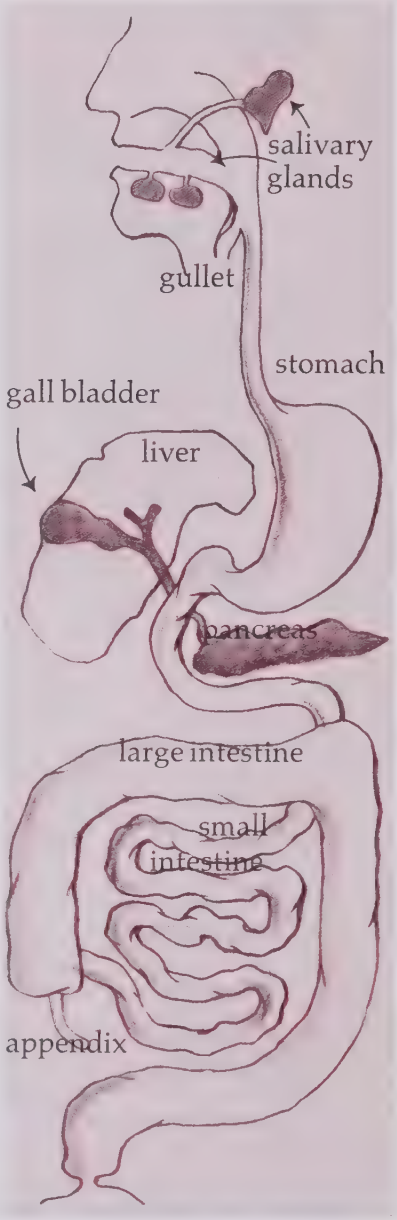
THE DIGESTIVE SYSTEM

The digestive tract is something like a hollow, flexible hose about thirty feet long, extending from the mouth to the anus. In its different sections, the digestive tract varies considerably in diameter. The stomach, for example, is a great deal wider than the rest of the tract.

The muscles in the walls of the tube-like tract contract and relax automatically in an orderly way, except in the mouth and at the lowest end of the tube; movement of both of these may be controlled consciously. In the mouth, food is chopped and crushed with the teeth. The muscles in the cheeks and tongue move the food around and so help the teeth to do their work effectively. The action of the automatic muscles vigorously mixes the food with the digestive juices, presses it against the walls of the flexible tube, and moves it down the tube. Usually, one is not aware of this digestive activity. The nerves that control these muscular movements also work automatically, but strong emotions such as anger, fear, or grief can affect these nerves and, as a consequence, digestion.

In addition to such mechanical work, the digestive canal also performs much chemical work on food. Nearly all of this is due to the action of a number of different enzymes which are able to gradually split the sugars, starches, fats, and proteins into the building blocks of which they are composed.

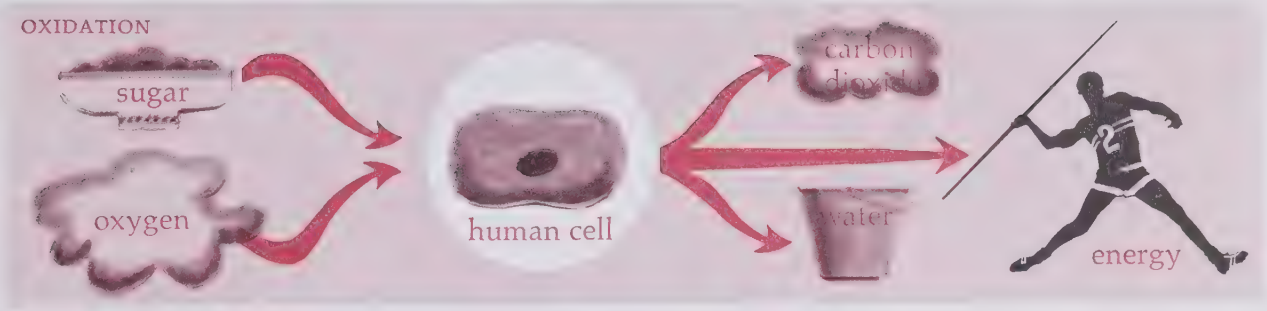
SIMPLIFIED DIAGRAM OF THE DIGESTIVE TRACT



CONVERSION OF FOOD INTO ENERGY

Unlike plants, human beings are not able to produce food and building materials from very simple substances. The nutrients must be supplied in ready-made form in food. In the human digestive canal, the carbohydrates, fats, and proteins are split into their simpler components. These then enter the blood stream which carries them to the billions of body cells. The bloodstream also transports the minerals and vitamins from food and from oxygen picked up in the lungs. The blood acts as a kind of floating cafeteria for the cells. From nutrients carried by the blood, each cell can select the materials it needs. To be of any value, oxygen, and all these simpler materials derived from food, must enter the cells.

All the cells in the body have to keep working twenty-four hours a



day, every day, and this naturally means that they must have a constant supply of energy. Fortunately, there are some stores of food energy in the body, mostly in the form of fat. There is also a small store of glycogen. Both fat and glycogen can be utilized at any time they are needed.

Cell energy comes from the burning or oxidizing of the simpler components of carbohydrates, fats, and proteins which contain what is called 'chemical energy.' OXIDATION is the process by which a substance combines with oxygen; oxidation really means burning and, obviously, that releases energy. When wood, for example, is burned or oxidized, it gives off heat energy and also some light energy. Thus, the chemical energy of the food has been changed into these two other kinds of energy. One might wonder how anything could be burned inside the human body without injury, yet each body cell can do so safely. Each cell contains a large number of different enzymes which act one after the other in rapid succession until the food material is completely oxidized. The enzymes need the help of several of the vitamins and some of the minerals to be able to do this; in the oxidation process, the vitamins and minerals act somewhat like the spark plugs in a gasoline engine.

Energy, then, is not destroyed, but it is changed into other forms. Fats and carbohydrates, when burned completely in the body, end up as carbon dioxide and water. However, proteins are not burned completely by the cells. Proteins are something like the charred sticks of a campfire that has gone out before all the wood has been completely burned; naturally, if one lights the charred sticks again, one will get more heat from them. The proteins, in turn, do release much of their energy, but not all of it. The parts of them that cannot be burned in the body are eliminated in the urine, mostly in the form of a substance called urea.

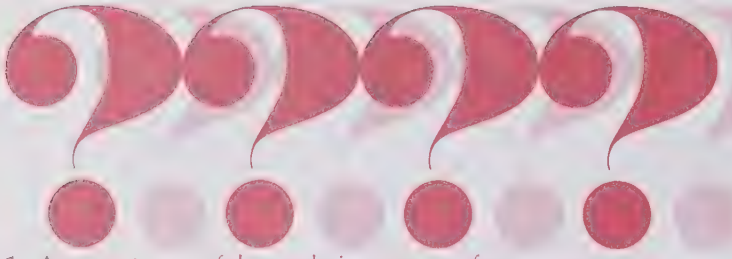
Kinds of Energy

Each of the many different kinds of cells in the body uses energy to do its own particular kind of work. Nerve cells change some of the chemical energy from their food into electrical energy which carries messages along nerves all through the body. Voluntary muscle cells contract so that the body can move in various ways; to do this, they change some of their food energy into the energy of movement, kinetic energy. The cells are only moderately efficient and a large fraction of the energy they use is turned into heat; however, this is useful because the inside of the body has to be kept quite warm. A great deal of the energy from food is used solely to keep the cells of internal organs, such as the heart and kidneys, functioning.

Words in small capitals (such as OXIDATION) are defined in the index entry.

◗ *To show how the chemical energy of a food is converted into other forms of energy, try the following experiment. Press a metal thimble or other small metal container into a thick slice of raw potato to hold it upright; this will serve as a crucible. Put half a teaspoon of corn oil in the thimble and make a wick from a piece of soft white string about one inch long. Dip both ends of the wick in the oil and leave one end in the thimble. Light the other end. Note the kinds of energy that the burning oil produces. Odd though it may seem, when one eats half a teaspoonful of corn oil, it is oxidized inside the body, and produces the same amount of total energy as did the oil burnt in the experiment.*

◗ This symbol indicates a practical test of materials related to the text.



1. Answer true or false and give reasons for your answer.
   a) The human body is much superior to any man-made machine.
   b) Only carbohydrates, fats, and proteins provide your body with energy.
   c) Plants are the original source of all food.
   d) Anger at mealtimes interferes with digestion.
   e) The kind of food you eat influences your appearance and your health.
   f) Body cells are specialized for their particular work.
   g) All you need to worry about is eating enough to satisfy your appetite.
2. Some people describe the digestive system as the "fuel refinery of the body." Do you think this is an adequate description of it? Give your reasons for agreeing or disagreeing with the statement.
3. Discuss the following statement: "All foods are organic because they come from living plants and animals. Table salt is an exception – you could call it a food additive."

CUISINE OF CANADA

The cuisine of Canada is the product of many influences–first, those of the native peoples and, then, those of the many waves of new settlers in the past and in the present day. Some, but certainly not all, of these have been illustrated in the following pages.

INUIT AND INDIAN

(A description of the kettles used by the Micmac Indians for most of their cooking before they traded metal kettles from the Europeans.)

[The Micmac]... kettle was of wood, made like a huge feeding trough or stone watering-trough. To make it, [the Micmacs]... took the butt of a huge tree which had fallen — they did not cut it down, not having tools fitted for that, nor had they the means to transport it. For... [shaping the kettles] they used stone axes, well-sharpened, and set into the end of a forked stick [where they were] well-tied. With these axes they cut a little into the top of the wood at the length they wished the kettle. This done they placed fire on top and made the tree burn. When burnt about four inches in depth [the kettles were] removed [from] the fire, and then [hollowed out by removing the burnt part] with stones and huge pointed bones, as large as the thumb,... Then they replaced the fire, and when it was again burnt they removed it all from the interior and began again to separate the burnt part, continuing this until their kettle was big enough for their fancy, and that was oftener too big than to little. The kettle being finished, it had to be used. To this end they filled it with water, and... that which they wished to have cooked. To make... [the kettle] boil, they had big stones which they placed in the fire to become red hot. When... [the stones] were red, they took hold of them with pieces of wood and placed them in the kettle ... [to make] the water boil. Whilst these were in the kettle,... [other stones] were heating. Then they removed those which were in the kettle, replacing them there by others. This was continued until the meat was cooked.

from the accounts of Nicolas Denys

N.D., pp. 401-402, *Making Canadian History*, Book 1, p. 23

... dried Provisions made of the meat and fat of the Bison under the name of Pemmican [are] a wholesome, well-tested nutritious food, upon which all persons engaged in the Furr Trade mostly depend... during the open season... [Pemmican]... is made of the lean and fleshy parts of the Bison dried, smoked, and pounded fine; in this state it is called Beat Meat: the fat of the Bison is of two qualities, called hard and soft; the [hard fat]... is from the inside of the animal... [soft fat] is made from the large flakes of fat that lie on each side [of] the back bone, covering the ribs, and which... [are] readily separated.... [When] carefully melted, soft fat resembles Butter in softness and sweetness.

Pemmican is made up in bags of ninety pounds weight, made of the parchment hide of the Bison with the hair on; the proportion of the Pemmican when best made for keeping is twenty pounds of soft and the same of hard fat, slowly melted together, and at a low warmth in a bag

Inuit (Eskimo) cooking utensils:
(Top row) Soapstone mixing and cooking pot, metal-blade scraping and chopping tool; (Bottom row) bone meat fork, and horn scoops.

(Photograph planned with cooperation and courtesy of Royal Ontario Museum)

of about thirty inches in length, by near twenty inches in breadth, and about four in thickness which makes them flat, the best shape for stowage and carriage.

[On] the great Plains there is a shrub bearing a very sweet berry of a dark blue color, much sought after, great quantities are dried by the Natives; in this state, these berries are as sweet as the best currants, and as much as possible mixed to make Pemmican.... I have dwelt on the above, as it is the staple food of all persons, and affords the most nourishment in the least space and weight even the... french canadian that devours eight pounds of fresh meat every day is contented with one and a half pound per day; it would be admirable provision for the Army and Navy.

from the accounts of David Thompson

David Thompson's Narrative 1784-1812, edited by Richard Glover (Toronto: The Champlain Society, 1962), p. 312-313.

Our meal was of two courses: the first, [fresh seal] meat; the second, soup. The soup is made by pouring cold seal blood into the boiling broth immediately after the cooked meat has been taken out of the pot, and stirring briskly until the whole comes nearly (but never quite) to a boil. This makes a soup of a thickness comparable to our English pea-soups, but if the pot be allowed to come to a boil, the blood will coagulate and settle to the bottom. When the pot lacks a few degrees of boiling, the lamp above which it is swung is extinguished and a few handfuls of snow are stirred into the soup to bring it to a temperature at which it can be freely drunk. By means of a small dipper the housewife then fills the large musk-ox-horn drinking-cups and assigns one to each person; if the number of cups is short, two or more persons may share the contents of one cup, or a cup may be refilled when one is through with it and passed to another.

from the accounts of Vilhjalmur Stefansson

Vilhjalmur Stefansson, *My Life with the Eskimo* (New York, N.Y.: Collier Books, The Macmillan Company, 1962), p. 181.

The Indians near the coast live on fish, which they are very dextrous in catching; they dry salmon in boxes in a kind of upper story in their huts. They prepare the roes, beating them up with sorrel, a plant with acid taste, till it becomes a kind of caviare, and, when the salmon are dried, boil and mix them with oil.

from the diary of Mrs. John Graves Simcoe

Making Canadian History, Book 1, p. 102.

Indian cooking utensils and containers:
(Opposite) Plains pemmican carrier; (Top row) Ojibway maple syrup trough, Ojibway scoop, Iroquois wooden mixing bowl; (Bottom row) West coast scoops with carved handles and a bowl for oolikan oil.

LOWER CANADA

Except in the Island of Montreal, very little fruit is grown; and that island, for its fertility in every production, may justly be called the garden of Lower Canada.

from the accounts of John Lambert

John Lambert, *Travels through Canada and the United States . . .*, London, 1816, pp. 128-177.
Making Canadian History, Book 2, p. 26.

Between the Mountain and the town of Montreal, there are a great many very fine gardens and orchards, abounding with a variety of fruit of the very first quality, and no place can be better supplied with vegetables than Montreal; Quebec, too, is extremely well supplied with vegetables, and a regular succession of fruit; but cannot vie with Montreal, where both soil and climate combine to produce the finest fruit I have ever seen. The apples are particularly good....Peaches, apricots, and plums, are found in the greatest perfection; and, with the protection of glass, you have grapes as good for the table as any I ever saw in Portugal. Currants, raspberries, gooseberries, and every sort of small fruit are found in great abundance. The markets of Montreal are extremely well supplied with all the necessaries and most of the luxuries of the table; provisions are particularly plentiful in winter, for then their industrious neighbours the Yankees bring in great quantities, such as fresh fish, bacon, cheese, &c. The greater distance of Quebec prevents them from receiving this sort of supply from the United States; but their own resources are copious.

from the accounts of Hugh Gray

Making Canadian History, Book 2, p. 24.

Their chief article of food is pork, as fat as they can procure it. They all keep a great number of swine, which they fatten to their likeing. Pea-soup with a small quantity of pork boiled in it, constitutes their breakfast, dinner, and supper, day after day, with very little alteration, except what is occasioned by a few sausages, and puddings made of the entrails when a hog is killed; or during Lent, when fish and vegetables only will suffice....
The Canadian country people bake their own bread, which is made of wheat flour and rye-meal; but for the want of yeast it has a sour taste, and is coarse and heavy. Their ovens are built of wicker-work plastered inside and out with a thick coating of clay or mortar. Some are built of bricks or stones, but the former are more general. They are situated at a short distance from the house, to prevent accidents from fire, and are raised about four feet from the ground, covered with a roof of boards, supported by four posts to keep off the rain.

from the accounts of John Lambert

Making Canadian History, Book 2, p. 27.

Public Archives of Canada

CHINESE

STUFFED CHICKEN

1 2 1/2-lb. chicken
2 oz. fresh or tinned Chinese mushrooms
2 oz. bamboo shoots
1/2 lb. raw pork
4 tbsp. soya sauce
1 small piece green ginger
salt and pepper to taste
1/2 bunch spring onions
1 lb. Chinese lettuce (or 1/2 lb. regular variety)
1 tbsp. cornstarch
cooking oil

Wash chicken and drain off excess water. Season with salt and pepper and coat outside with 2 tbsp. soya sauce. Fry in hot oil in deep saucepan. Remove from heat and allow to cool.

Soak Chinese mushrooms in boiling water for at least 1/2 hour. Drain off water and reserve it for gravy.

Cut mushrooms, bamboo shoots, pork, and spring onions into thin strips, approximately 1" to 1 1/2" in length. Mix together with remaining soya sauce, salt and pepper, and chopped green ginger.

Stuff chicken with mixture. Sew up and steam 1 to 1 1/2 hours until tender.

Wash Chinese lettuce. Cut into 1" pieces and fry lightly in oil. Place on platter and place the chicken on it. Remove the sewing thread from the chicken.

Prepare gravy by boiling the mushroom water, adding salt and pepper to taste. Mix cornstarch with cold water to a smooth paste and add boiling mushroom water to the cornstarch mixture, stirring constantly to avoid lumps.

Pour gravy mixture over chicken and serve.

(Note: the preparation of the chicken can be done in advance and the chicken steamed just before serving.)

SHIRLEY LEE SHEW

JAPANESE

SUKUYAKI

**1 1/2 lbs. beef fillet or sirloin*
12 green onions
**1 12-oz. can bamboo shoots*
**1 16-oz. can shirataki*
**4 tofu (bean curd)*
1 12-oz. can white button mushrooms
**1/2 lb. bean sprouts (not canned)*
**1 lb. hakusai (Japanese lettuce) or Chinese lettuce*

SAUCE

**1 cup mirin*
**3/4 cup soy sauce (Japanese type)*
1/4 cup water
1/4 cup sugar
1 tsp. monosodium glutamate

Slice beef paper thin. If meat is half-frozen, it will be easier to slice. Diagonally slice green onions into pieces 2" in length. Cut bamboo shoots into 1/4" thick slices. Cut bean curd into 1" cubes. Cut lettuce into bite-size pieces. Diagonally slice remaining ingredients.

Arrange all ingredients on a tray or large platter to be placed on the table.

In the centre of the table, boil the sauce in an electric frypan or heavy skillet over a flame. Cook a little at a time as you eat. Do not overcook the food. Remove food to plates when done and re-fill the frying pan. Serve food with steamed rice.

As an alternate method, try dipping cooked ingredients into a beaten raw egg mixture before eating them.

*These items are available at Japanese groceries in most large cities.

MITSUKO LOUGHTON

ITALIAN

LASAGNE

1 lb. ground beef-and-veal mixture
2 eggs
1 lb. lasagne noodles
3/4 lb. mozzarella cheese
3/4 cup (approx.) romano cheese
2 hard-boiled eggs
bread crumbs
salt and pepper to taste

PREPARE SAUCE by browning onions and garlic in oil in saucepan, until they are golden.
Add remaining ingredients and stir until blended well.
Cover and let simmer over low heat at least one hour, stirring continuously.
Add small amounts of water if the mixture becomes too thick.

PREPARE BEEF by mixing it with raw eggs, bread crumbs, salt, pepper, and romano cheese until mixture is just moist.
Brown beef mixture in frypan with oil.
Add meat to already simmering tomato sauce and continue to simmer.

TOMATO SAUCE

1 28-oz. can stewed tomatoes
1 6-oz. can tomato paste
1 tsp. chopped garlic
1 tbsp. chopped onion
1/4 cup olive oil
1 whole bay leaf
1 tsp. sugar
1/4 tsp. salt
1/4 tsp. pepper
1/2 tsp. oregano
1/2 tsp. mint

PREPARE NOODLES by adding them to salted water brought to a boil in a large pot.
When noodles are half-cooked, remove them from the heat, drain, and pass them under cold water.
Pour a small amount of the tomato sauce into the bottom of a large, deep, oblong baking dish with a cover.
Make layers of noodles, meat sauce, sliced hard-boiled egg, mozzarella and romano cheese.
Repeat layers until all of the ingredients have been used, ending with the cheese layer.
Cover and bake at 350° Fahrenheit for 20 minutes.

LORRAINE AGLIALORO

GREEK

BAKLAVA

1 lb. filo (thin pastry sheets available in most Greek grocery stores and bakeries)
1/2 lb. butter
1 cup walnuts
1/2 tsp. cinnamon

SYRUP

1 cup sugar
1 cup water

Make layers of two filo brushed with butter, some of the walnuts, finely chopped, and a dash of cinnamon.
Repeat layers until all of the nuts have been used.
For the topping, use 3 to 4 filo brushed with butter.
Fold the sides in and cut with a sharp knife into diamonds.
Bake at 350° Fahrenheit until the top is light brown.
Let cool while making the syrup.

Cook sugar and water together until the mixture thickens.
Pour syrup over the baklava.
Let cool completely.

ANNA KLISOURAS

colos
pigeon peas
yellow yam
dasheen
gence
same
caralie
eddos
sweet potato
beans
papaya
sorrel
avocado
sweet yam
chohis
cocos
okra
breadfruit
jack fruit
coconut
sweetsop

cumin seed
poppy seed
black pepper
pure cayenne pepper
whole cloves
mint
ground cardamon
cardamon seed
whole cinnamon sticks
saffron threads
foenugreek seed
coriander seed
garlic cloves
green chilis
peppers
ginger root

CARIBBEAN

COCONUT LOAF

6 cups flour
3 cups brown sugar
6 tbsp. baking powder
1 tbsp. salt
1 tsp. nutmeg
1 tsp. cinnamon
1 tsp. ground cloves
1 lb. raisins
1/2 lb. currants
1/2 lb. margarine
1 coconut, grated
1 1/2 cups water
1/2 cup rum or any wine

Grate the fresh coconut.
Combine all ingredients together in one bowl.
Add water and rum.
Mix well and place in greased loaf pan.
Bake at 350° Fahrenheit until top of loaf springs back when lightly touched.

SHEILA GRIFFITH

PEAS AND RICE

1 cup split peas
2 cups rice
salt
3 1/2 cups water

Soak peas for 2 hours. Wash and bring to a boil.
Wash rice. Add rice to peas and cook over medium heat until all moisture is absorbed.
Reduce temperature until peas have cooked.
Salt to taste.

PAKISTANI

BIRYANI
(SAVOURY MEAT RICE)

1 1/2 lb. lamb or beef
2 sticks cinnamon
6 whole cardamons
6 whole peppercorns
1 tsp. cumin seeds
1" fresh root ginger
4 green chilis (hot)
4 cloves garlic
1 bunch fresh coriander leaves or 2 tsp. ground coriander seeds
1 bunch mint leaves or 2 tsp. dried mint
1/2 lb. sieved cottage cheese
1 cup clarified butter or cooking oil
6 large onions
5 large boiled potatoes
salt
1/2 tsp. saffron
5 cups cooked rice (reserve a little of the cooking water)

Pound together, coarsely, cinnamon, cardamons, peppercorns, cumin, ginger, green chilis, and garlic cloves. Chop coriander and mint leaves. Mix into cottage cheese.
Heat butter or oil and fry onions until golden brown. Remove onions and set aside.
In a large casserole, place mutton and sliced, seasoned, potatoes. Sprinkle spice mixture on top, then spread cheese mixture and saffron over the spices. Add onions and top with boiled rice. Sprinkle clarified butter or oil and rice water over the rice.
Bake in hot oven, 350° Fahrenheit, until all water has evaporated. Continue to cook until potatoes are done.

BARBARA (MACDONALD) FANCY

UKRAINIAN

HOLUBTSI

2 large heads old (soft) cabbage or 3 to 4 small heads
several rashers of bacon
1 14-16-oz. can stewed tomatoes

FILLING

2 cups raw rice
2 lbs. ground pork
salt and pepper to taste
onion powder to taste . .
garlic powder to taste
1 tsp. monosodium glutamate
1-2 cooking onions or dried minced onion to taste

Before beginning the filling preparation, soak cabbage in hot water to soften. Cut away the core so that the leaves will separate.

TO MAKE THE FILLING:

Brown pork and onion, seasoning the mixture generously with the onion powder, garlic powder, and monosodium glutamate. Drain fat.

Parboil rice by cooking it for one half the time given in the package directions. Drain till fairly dry.

Mix rice and pork thoroughly, adding further salt, pepper, onion and garlic powder to taste.

TO STUFF THE CABBAGE LEAVES:

Remove any damaged or yellow outer leaves, saving them for the final stage.

Separate the cabbage leaves, cutting away or thinning any thick parts near the core.

Rub roasting pan with bacon fat. Line bottom of pan with raw rashers of bacon.

Holding cabbage leaf in palm of hand, spoon in filling. Wrap and place roll in roasting pan with folded edge down to keep the roll together.

Salt and pepper each layer generously. The cabbage absorbs a great deal of salt.

Break up the stewed tomatoes with a fork. Spoon over the layers. Cover the top layer with the discarded leaves.

Bake at 350° Fahrenheit for 1 1/2 to 2 hours until cabbage can be cut with a fork. Discard the top leaves before serving.

MARION RAYCHEBA

AUSTRIAN

SEMMELKNÖDELN

6 slices stale bread or
6 old buns, cubed

1/4 cup lard or shortening

1 medium onion, chopped

1/2 cup parsley, browned in butter

2 eggs

1 cup milk (approx.)

Mix all ingredients together with hands. Add enough flour to make the dough easy to handle, yet still be moderately sticky.

Roll dough into long rope and cut into sections to form medium-sized balls, around the size of medium potatoes.

Bring salted water to a boil in a large pot. Carefully drop dough balls into the boiling water. Let boil for one minute.

To test for doneness, take one dough ball out and cut in half; it should not be sticky.

URSULA WILLIAMSON

Dining room of the Farm House which is restored to the 1860's (Upper Canada Village photo).

Each cell in the body is a miniature machine and it must be supplied with energy to do its work. The amount of energy that a food provides is measured in kilocalories, commonly shortened to calories. One CALORIE is the amount of heat needed to make one litre, or thirty-five ounces, of water one degree Centigrade warmer. Thus, a helping of food that gives fifty calories would produce enough energy to raise the temperature of fifty litres of water one degree Centigrade. However, the calories one eats in foods are not used in the body just for the produtcion of heat. They are a useful measure of the total energy that a weighed serving of food supplies.

MEASUREMENT OF CALORIE VALUES

Before chemists can determine the calories that a weighed helping of a certain food will give, they must determine the amount of protein in it. They must allow for the fact that a constant percentage of the energy of the protein in the food will not be available when it is burned in the body. After doing so, they can then place the small, accurately-weighed portion of that food in a calorimeter, a heat-measuring device. The food is burned in the calorimeter and the amount of heat – energy, it gives off is accurately measured.

There are often complaints that the figures vary for the same food in different calorie tables. While some of the tables may have been carelessly prepared, some variation is often due to different sizes of servings, differences in recipes and, even to the natural differences in varieties and cuts of foods.

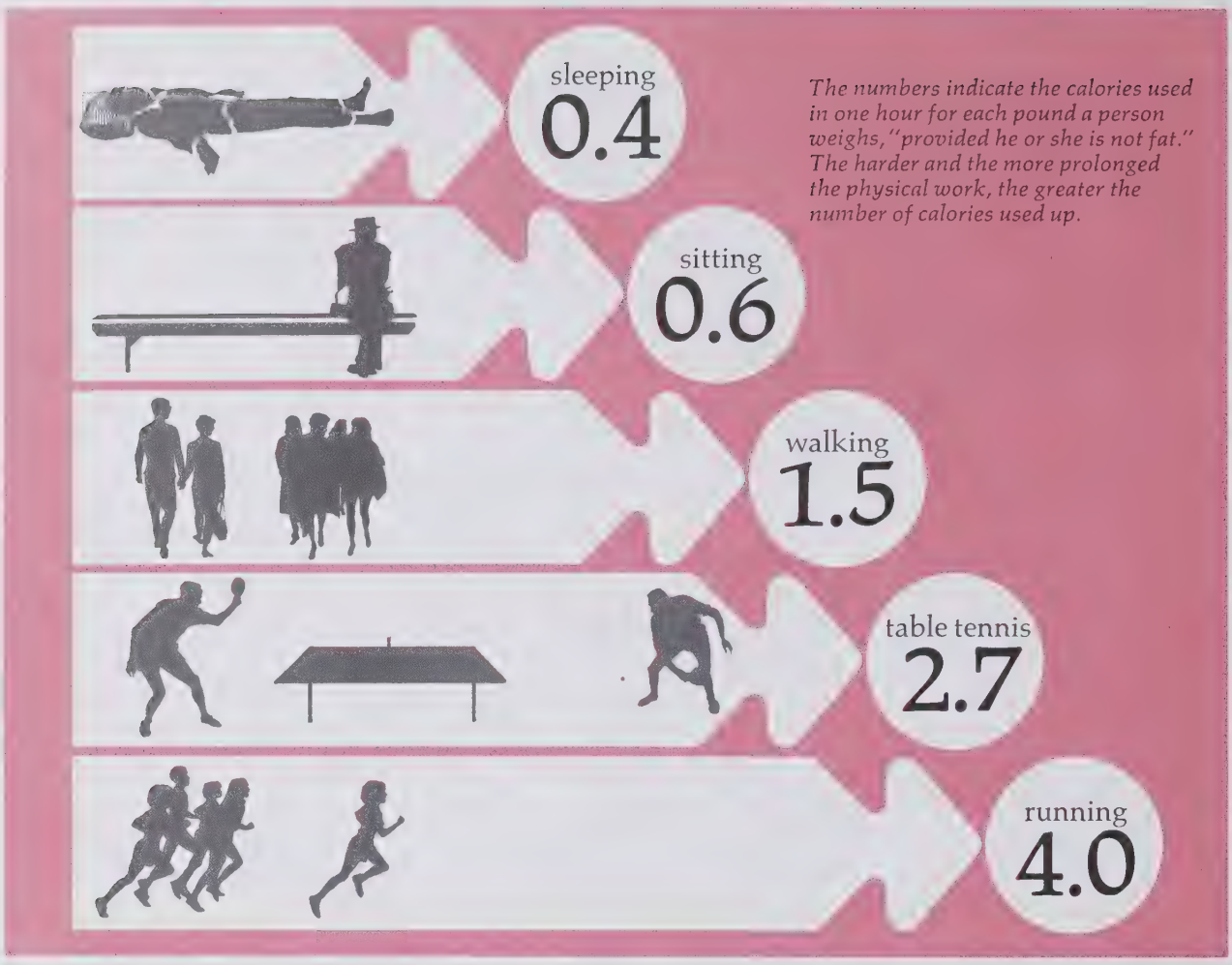
The energy value of foods is sometimes expressed in terms of megajoules (MJ) instead of calories. A megajoule is a much larger unit, as 4.186 megajoules are equal to 1000 calories.

CALORIE REQUIREMENTS

When asleep, the body is using up the minimum amount of energy or calories. Awake, the more strenuous and the more prolonged the physical activity of the body, the more energy or calories expended. Large persons use up more energy than smaller ones doing the same amount of

Using a calorimeter, nutritionists have carefully measured the heat given off – the calories produced, when one tablespoon of corn oil, a 100-percent fat, is burned. They have found its calorie count to be 126. The same weight of sugar, a pure carbohydrate, has a calorie count of 56. When the same weight of a pure food protein is burned for energy in the body, it also provides 56 calories. Thus, pure fats produce 2 1/4 times as many calories as the same weight of pure carbohydrate or pure protein in the body. It is not surprising, then, that foods containing considerable fat, such as nuts and potato chips, are high in calories. Lettuce, cantaloup, and nearly all fruits and vegetables that are eaten raw, are relatively low in calories. This is because they contain a great deal of water which gives no calories.

In food tables, the amounts of carbohydrate, fat, and 'body-useable' protein are usually given in grams. A gram is only 1/28 of one ounce. One gram of carbohydrate or of 'body-useable' protein gives 4 calories and one gram of fat, 9 calories.



The numbers indicate the calories used in one hour for each pound a person weighs, "provided he or she is not fat." The harder and the more prolonged the physical work, the greater the number of calories used up.

physical work because it takes more effort to move a big body around than it does a lighter one.

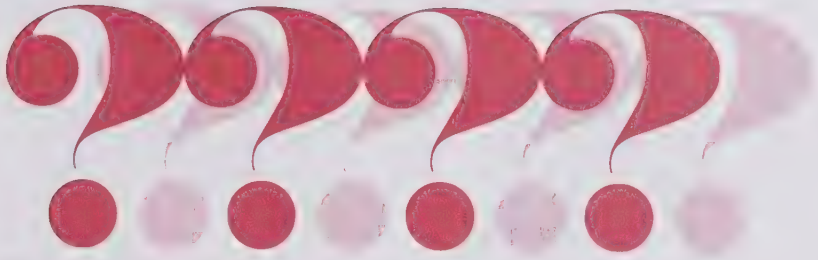
Nutritionists can estimate how many calories adolescents, for example, need to eat each day in order to provide for the energy they are expending. Such an estimate of the total daily need for calories can only be approximate since adolescents vary so much in size, in the rate at which they are growing and, in their daily activities.

Each person possesses a remarkable internal mechanism that automatically regulates appetite. If one regularly takes some physical activity, even as mild as walking, the appetite-regulating mechanism is better able to do its work normally. If one makes a habit of eating more calories than one uses, too much fat is stored in the body.

Some people, who are gaining too much weight because they are eating more than they need, try skipping breakfast in order to reduce. This rarely has the desired effect since breakfast skippers nearly always snack more or eat larger lunches or dinners. Besides, about 80 percent of them finish the day short of one or more of the essential nutrients such as vitamin C, calcium, or thiamin.

Using a stationary bicycle with a work-measuring device attached, a nutritionist measured the maximum work teenage girls could do on it in one minute. The tests were done in the middle of the morning.

Several tests were done on each girl. On some days, the girls ate a breakfast of orange juice, cereal, toast with butter and jam, and milk. On other days, they skipped breakfast. On the breakfast days, they could work harder on the bicycle and also did better in another test in which they had to push a button as soon as a light was flashed on. This second test measured alertness. The girls also felt more comfortable and could do more mental work on the days when they had eaten breakfast.



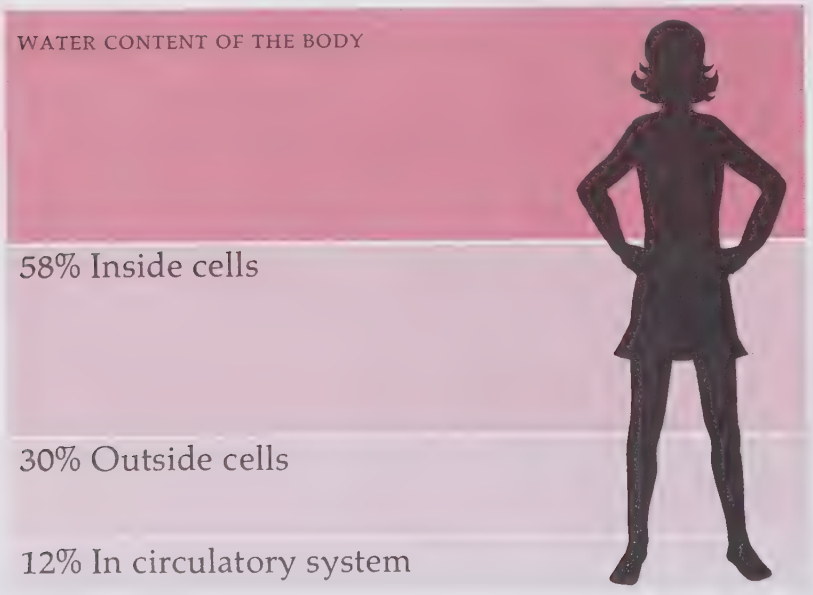
1. Answer true or false and give reasons for your answer.
   a) The blood carries simple food substances derived from digested food to the millions of your body cells.
   b) Each cell needs to be supplied with several vitamins and some minerals to obtain energy from these simple food substances.
   c) The energy provided by food is measured in calories.
   d) Calories are needed to keep your body functioning.
   e) You need to eat more when you use your muscles vigorously.
   f) Hard studying uses many calories.
   g) Vitamin pills furnish energy.
2. An object is said to be in a dynamic state when it is doing some kind of work and using up some kind of energy. What are some examples of objects in a dynamic state? Do not limit your list to inanimate objects.
3. Discuss the various effects on a person of taking too little food to meet energy requirements. What is one effect of taking too much food? How does increasing or decreasing physical activity affect the balance?
4. Why might a person eat too little food? Why might someone eat too much?
5. One gram of alcohol provides 7 calories. Using food tables, find out the number of calories in 8 ounces of beer, $1\frac{1}{2}$ ounces of whiskey, $3\frac{1}{2}$ ounces of sherry, and $10\frac{1}{2}$ ounces of table wine.
6. One slice of bread gives you 16 grams of carbohydrates, 0.6 grams of fat, and 2.5 grams of protein. How many calories does it give you? Ten grams or 2 teaspoons of butter or margarine, both of which are 80 percent fat, give you how many calories?

3 Water

It is surprising to think that there is more water than anything else in the body. In fact, the body is about 66 percent water. Water is almost as important to the human body as it is to the support of aquatic life. A person who is deprived completely of water will die in about three days.

FUNCTIONS OF WATER

All body cells contain water and nearly all of them are surrounded by a thin layer of water. All of the complex chemical activities that go on inside the cells take place in very moist material. The food and oxygen-distributing system, the blood, is more than half water. It is important to realize that all this "body water" has many different substances or compounds, especially minerals and proteins, dissolved in it. The body has mechanisms which, together, keep the right kinds and the right amounts of these compounds in the blood and in the water inside and outside the cells.



SOURCES OF WATER

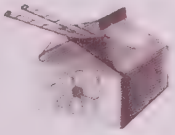
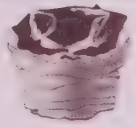
The water needed by the body is obtained in three ways: from water and drinks of all kinds; from apparently solid foods; and, from chemical processes in the body itself.

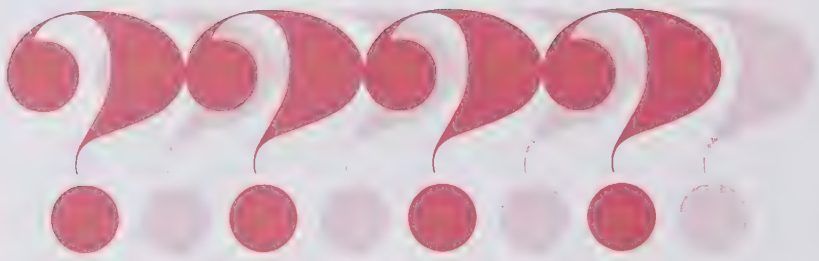
All the common non-alcoholic beverages are 87 to 100 percent water.

Bread is about 35 percent water; cake is a little drier. Cookies or crackers are only 5 percent water. Cooked lean meat is about 50 to 60 percent water. In fact, all apparently solid food averages about 50 percent water. Although they look solid, nearly all the unprocessed fruits and vegetables are 80 to 95 percent water. Boiled or baked vegetables contain almost as much water. However, when they are cooked in very hot fat, much of their water is driven off and a good deal of fat is added. Some of the foods lowest in water include white sugar, peanut butter and peanuts, other nuts, raisins, and potato chips. Water, itself, does not provide any calories. Therefore, the foods that have a high water content cannot by themselves have a high calorie count.

When body cells oxidize carbohydrates, fats, or proteins to obtain energy, they produce water and also carbon dioxide. The excess carbon dioxide is carried by the blood to the lungs where it is expelled. Any excess water is carried to the kidneys, one of whose main jobs is to keep the total amount of water in the body constant.

WATER CONTENT OF FOODS

HIGH	*milk*		*87%*
	apple		*85%*
MEDIUM	*roast beef*		*50%*
	bread		*35%*
LOW	*peanut butter*		*2%*
	potato chips		*2%*



1. Answer true or false and give reasons for your answer.
   a) You need to drink eight glasses of water each day.
   b) It is not a good idea to flavor or sweeten all the water you drink.
   c) Water itself gives you calories.
   d) You do not get water in solid-looking foods.
   e) Your body has more water in it than any other substance.
2. If you eat a 1½-ounce package, about 45 grams, of a food that is approximately 45 percent fat, 25 percent protein, and 25 percent carbohydrate, how many calories would you obtain from the food? Would you describe it as a high-calorie or a low-calorie food and why would you do so?
3. All the common vegetables, either raw or cooked, contain less than 1 percent fat and only a few have as much as 6 percent protein and 20 percent carbohydrate in them. What is the remainder of their content? As a source of calories, how would vegetables rank with your other foods?
4. Using food tables, find out what percentage of water the following foods contain: bananas, bread, butter, cake (iced), caramels, corn oil, chocolate bars, cookies, doughnuts, eggs, hamburgers, jam, margarine, milk, oats (cooked rolled), oranges, peaches, peanuts, mayonnaise, salmon (canned), shortening (vegetable), and strawberries. You will have to supplement this book's food tables with some more detailed ones; check the bibliography for lists of food tables. Note that some tables list water as moisture content. If the food is listed as containing 100 percent of a nutrient, there is no water in it.

4 Carbohydrates

The common food carbohydrates are of three types: the sugars; the starches; and, the celluloses.

SUGARS

Functions of Sugars

The sweet taste of sugars make them useful for sweetening and flavoring many foods. Sweet foods satisfy the appetite very quickly. Another characteristic of the sugars is that they dissolve readily in water.

Composition of Sugars

The label on sweet foods may include glucose, as one of the listed ingredients. Chemically speaking, glucose is one of the simplest types of sugar eaten. It is called a monosaccharide, a single sugar.

Ordinary white sugar, whose technical name is sucrose, is a somewhat more complicated substance made of units (molecules) of one kind of double sugar, a disaccharide. These two linked sugars are glucose and fructose. Sometimes a label states that a food contains 'invert' sugar. This merely means that the sucrose has been split into its two component single sugars, glucose and fructose.

This simplified diagram shows the chemical make-up of the two common types of sugar.

Processed Sugars

WHITE SUGAR

White sugar is made either from sugar cane or sugar beets, both plants producing sugars identical to each other. When they are harvested, sugar beets are about 20 percent sugar and about 80 percent water, although they do contain small amounts of proteins, mineral salts, and vitamins. At the sugar factory, the beets are shredded and soaked in successive baths of water until practically all their sugar has seeped out into the water. This sugar-containing water is heated to drive off most of the water and treated with lime and other chemicals to remove everything but the sugar. Later, it is dried and crystallized. The white sugar one buys is 99 1/2 percent sugar, the other half of one percent is the so-called 'water of crystallization.'

Sugar, in fact, is the driest food eaten. Partly because very sweet foods such as sugar or candy are so dry, they contain a great many calories relative to the small size of a serving of them. As the proteins, minerals, and vitamins that were originally present in the beets or cane have been removed, the sugar produced is a single-use food; it gives energy or calories only. While other foods supply calories, nearly all of them provide more than one nutrient.

OTHER SWEETENERS

Brown sugar has not been purified as completely as has white sugar but it too supplies very little else besides calories, as do the dark brown Demerara and the so-called 'raw' sugars sold by health food stores.

Corn syrup, cane syrup, and maple syrup are about three-quarters sugar and one-quarter water; they also are similar to sugar in food value, although their flavors vary. The advertisements that recommend corn syrup as a source of quick energy are often misunderstood. Corn syrup may be handy as a snack for athletes who are swimming or running long distances. Possibly that is how it got its reputation as a source of quick energy. For ordinary activities, one may obtain energy quite quickly enough from regular meals and snacks.

Honey has a pleasant, distinctive flavor but it, too, is no better nutritionally than the other concentrated sweets. Some health food enthusiasts claim that honey's food value is superior to that of sugar because it is a natural sweetener. Unfortunately, it contains little else but sugar and water. It adds but extra cost and a different taste to meals.

Jams, fruit jellies, and marmalades are 65 to 70 percent sugar; most of the rest of them is water. Carbohydrate calories are nearly all they add to meals.

All candies are largely sugar. Those with chocolate or nuts in them also contain a good deal of fat which raises their calorie counts considerably.

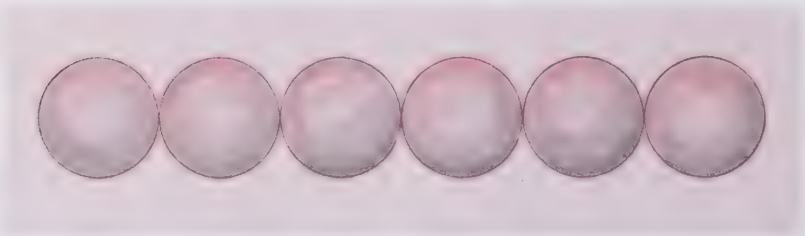
Molasses is about 65 percent sugar. One tablespoon of light or medium molasses does give about one-tenth of the recommended daily quota of iron and a tiny amount of calcium.

gives 50 to 60 calories and very little else but sugar

STARCHES

Composition of Starches

Each tiny unit of starch is made of thousands of even smaller units of the single sugar, glucose, joined together in chemical union.



This simplified diagram shows the chemical make-up of a very small part of a starch unit (molecule). Starch is made of many glucose units joined together.

Sources of Starches

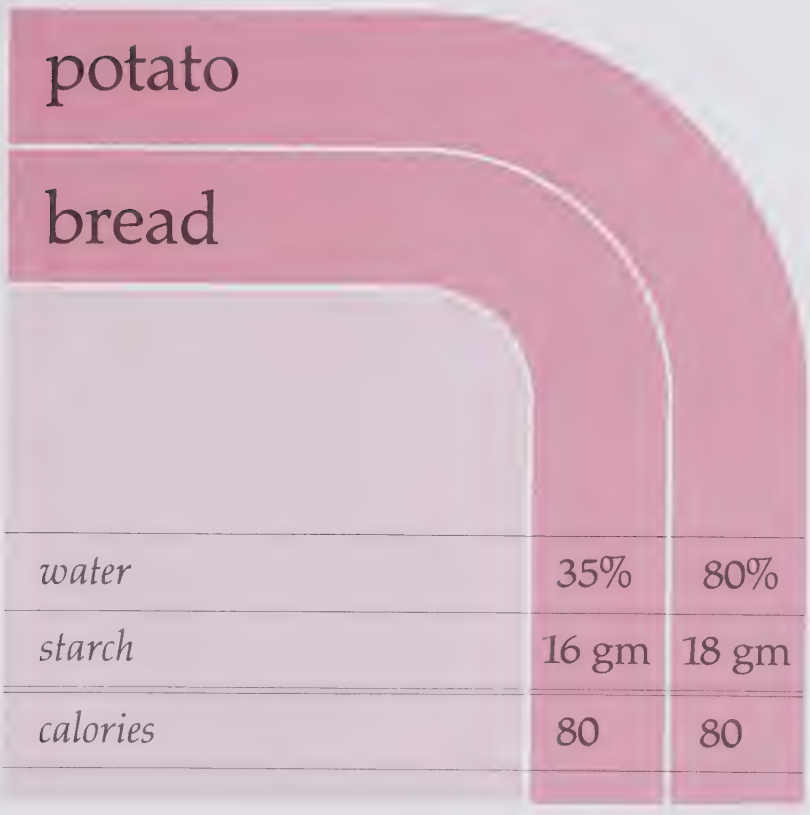
GRAINS

Most edible starch is in foods made of grains. Bread, for example, is about 50 percent starch. When harvested, grains, such as wheat, rice, oats, and rye, are two-thirds to three-quarters starch. All of them can yield heavy crops per acre. They usually keep well when stored and they are relatively inexpensive to process. Because they possess all these characteristics, such starches form the core of most people's meals in both the temperate and the tropical zones. In some of the Middle and Far Eastern countries, many of the people eat three-quarters or more of their calories in the form of grain food. In North America, many people obtain one-third or more of their calories from foods made of flour and other grains. Studies have shown that, as the family income increases, less of these foods is usually eaten.

VEGETABLES AND FRUITS

Boiled or baked potatoes are only about one-fifth starch; most of the rest of the weight of potatoes is water. Fresh or canned corn, frozen lima beans, and the cooked, dried legumes such as beans, peas, and lentils, are also about 20 percent starch. Bananas and sweet potatoes are a little higher in both starch and sugar; the other vegetables and fruits are lower in carbohydrate.

Add approximately three parts of water to one part of the usual 2.5-percent tincture of iodine that you can buy in a drugstore. Be careful because iodine is poisonous. Using a matchstick or a clean eyedropper, add the iodine solution to some foods that you suspect contain starch. Try this test on flour, cornstarch, baking powder, meat spread, raw and cooked rolled oats, crushed ready-to-eat cereal, a raw potato, and a raw unripe banana. When the food to be tested is a moist food such as a raw potato, apply the iodine solution to the food with the matchstick; when the food is dry, use the eyedropper to drop the iodine on a little mound of the food. If a purplish-black color appears, the food contains starch and the test is positive. If the color is merely yellow, the test is negative, as the iodine itself is that color. Make a chart to show your results. Try the same test on a small amount of sugar.



CELLULOSE

Composition of Cellulose

Cellulose, too, is made of large numbers of glucose units but, unlike starch, these units are bound together by links that cannot be broken apart in the digestive canal.

Functions of Cellulose

Because cellulose remains undigested in the canal, it adds bulk and gives the intestinal muscles additional material to move along. In this way, cellulose helps to prevent constipation. Its ability to hold water, almost like a sponge, adds to this effect.

Sources of Cellulose

Cellulose serves as the supporting and covering material of plants and their seeds. Bran, for instance, has more cellulose in it than does any other common food, yet in the making of white flour, the bran, the brown outer layers of the wheat kernel, is removed.

Compared with the consumption of starch and sugar, little cellulose is eaten in meals.

DIGESTION OF CARBOHYDRATES

Saliva contains some slippery mucus, to help in the swallowing of food, and an important enzyme. The enzyme in saliva starts the digestion of starch by splitting the long chains of glucose into shorter chains. This enzyme can only do this work when conditions are neither too acid nor too alkaline. Saliva itself helps the activity of the enzyme because saliva is neither acid nor alkaline.

The inner wall of the stomach produces a digestive juice that is normally strongly acidic. When the mixture of carbohydrate and saliva reaches the stomach, the salivary enzyme continues to break up the starch until the churning mass of food becomes acidic, due to the added stomach juice. Later, when the carbohydrate enters the small intestine, it is acted upon by two more enzymes: one in the intestinal juice, made in the inner wall of the intestines; and, the other in the pancreatic juice, made in the pancreas. A watery solution containing the pancreatic enzyme flows from the pancreas to the small intestine through one or two small tubes or ducts. Between them, these two enzymes reduce the carbohydrate fragments to the double sugar stage. The double sugars then enter the cells that form the lining layer of the small intestine. Here, the double sugars are split into single sugars which promptly enter the tiny blood vessels under these lining cells.

The process whereby such substances as glucose, are able to leave the intestine and enter the blood stream, is called ABSORPTION. It may seem a rather simple process but modern research has shown it to be highly complicated.

1. Answer true or false and give reasons for your answer.
   a) Sugar is your poorest food.
   b) You cannot digest cellulose – therefore, it is not useful.
   c) The grain foods give you only starch.
   d) Honey, raw or brown sugar are far better foods than white sugar.
   e) If you crave sweet foods between meals, it means that your body needs them.
   f) Under ordinary circumstances, corn syrup is needed for quick energy.
2. Compare the cost and food value per ounce of white sugar, brown sugar, raw sugar, Demerara sugar, corn syrup, maple syrup, and honey.
3. See if your classmates, when blindfolded, can tell the difference between pure maple syrup and several brands of artificially-flavored maple syrup. How do these products compare in price?
4. Compare the cost per ounce of as many kinds of strawberry jam as you can find. Taste them. If you were shopping for your family, which kind would you buy and for what reason?
5. In what other ways, not mentioned in the text, is sugar useful?
6. Read the labels on containers of pudding or pie mixes and sundae toppings. Which of them contain glucose (dextrose)?
7. Which food is highest in cellulose?

FUNCTIONS OF FATS

Many people enjoy the taste of foods that have been fried in fat. Adding some fat can make foods taste better; the flavor of bread and rolls, for example, is improved by adding margarine or butter, and fat also partially water-proofs bread so moist sandwich fillings do not soften it. Oils and fats, both, are insoluble in water.

Absorption of the carotene found in yellow or green vegetables is more efficient with the addition of fat; the oil in salad dressings or mayonnaise has the same effect.

Because fats are concentrated sources of calories, foods containing them are good for people doing heavy muscular work. Such people would have to eat a far larger total weight of other foods to satisfy both their hunger and their need for calories as well; fat-rich foods have good staying power because they are digested rather slowly.

The only sizeable reserve supply of food energy in the body is in the form of fat. About 20 percent of the weight of the body of a normal young woman is made up of fat. In a healthy young man, the figure is less, about 12 percent. Each person draws on body fat stores when no food is eaten for a considerable time; body fat stores are replenished when food is again eaten.

Much of body fat is stored under the skin where it serves as insulation against the cold and also as protection for underlying bones and organs, somewhat like the padding that professional movers wrap around furniture. Other pads of fat help to protect and anchor certain important organs, for example, the kidneys. A suitable amount of fat also improves body appearance.

Fats, in combination with other substances, are essential parts of the covering membrane surrounding every cell in the body. Somewhat similar substances form the insulation around the individual fibres in the nerves which carry billions of messages throughout the body every day.

Fats are valuable because they:

- ☐ *make some foods taste better*
- ☐ *waterproof sandwich breads*
- ☐ *satisfy hunger*
- ☐ *supply the extra calories needed for heavy jobs*
- ☐ *help the body to use carotene*

In the body, fat acts:

- ☐ *as the main reserve of food energy*
- ☐ *under the skin, as an insulation layer against cold*
- ☐ *in pads, as a protective layer for bones and organs*
- ☐ *as an improver of body appearance*
- ☐ *as an essential part of cell membranes*
- ☐ *as a part of the insulation around nerve fibres*

◗ *Obtain a large brazil nut and a metal lid or shallow tin. Shell the nut and cut off a small piece from the top and bottom of the nut so that it stands upright on the tin. Light the top of the nut with a match. What happens? What does this result tell us about the nut? Try the same test with other kinds of nuts, impaling them on upturned thumbtacks to keep them upright on the tin and applying the match to a 'skinless' part.*

To see how fat burns, try the following three experiments. (1) Collect your equipment: scissors, tweezers, a candle, a pan — perhaps an empty sardine can, to catch the drip, a slice of lean side bacon, and part of a sugar lump. Cut a short strip, about a quarter of an inch wide, from the fat part of the bacon and a similar strip from the lean. Holding the fat strip with the tweezers, put it in the candle flame. How does it burn? Why does it sputter? Do the same with the strip of lean bacon and the small piece of lump sugar. How do they burn? Did you notice any smell when the lean meat was burning? Write down your observations and conclusions. (2) A metal thimble or other small metal container pressed into a slice of raw potato will serve as a crucible. Fill it with vegetable oil. Make a wick from a piece of soft white string about one inch long. Dip both ends of the wick in the oil and put one end in the thimble. Light the other end. How does it burn? Record your observations. Melt a little butter, put it in the thimble like the vegetable oil, and see how well it burns at the end of the wick. Repeat the same experiment using melted margarine. Make a record of your observations. (3) Warm a little commercial mayonnaise and pour it in the thimble. Moisten the wick with mayonnaise and put it in the thimble. See if it will burn. You may have to relight it several times. Record your observations. Did the vegetable oil and the fat part of the bacon burn harder than the lean part – mostly protein, or the sugar – carbohydrate? If the oil and fat burned more vigorously, what idea would that give you about these three nutrients as sources of energy or calories?

PROCESSING AND ITS EFFECT UPON FATS

The term, fat, is often used if the substance is solid at ordinary room temperature, the term, oil, if it is liquid. Technically, both are fats. Fats can withstand a great deal of heat without change. This contrasts with most proteins which are changed both in appearance and in consistency when exposed to temperature as low as 140° Fahrenheit. However, when the temperature becomes too high, fats do break down and give off an irritating, unpleasant-smelling smoke. Fats boil at approximately 360° Fahrenheit to 400° Fahrenheit. For this reason, meats, and some other dishes that are more appetizing when cooked at a high temperature, are often fried in hot fat rather than boiled in water. One must realize, though, that frying many foods greatly increases their fat content. As an example, when French-fried, potatoes lose nearly half the water they contain as fat seeps in and drives out the water. Ounce for ounce, French fries provide nearly four times as many calories as do boiled potatoes.

POTATOES	FAT	WATER	STARCH	CALORIES
french-fried potato 4 oz	13%	45%	36%	340
boiled potato 4 oz	0.1%	78%	20%	85

PROTEIN CONTENT OF POTATOES HAS BEEN LEFT OUT

Frying drives a good deal of water out of potatoes, replacing much of it with fat.

fa, FA, and Fa = three different fatty acids

Fats vary because each arm of the E, used here to represent glycerol, may have a different fatty acid attached to it. Or, all three arms may have the same fatty acid attached; or, two of the arms may have the same fatty acid with the third acid being different.

COMPOSITION OF FATS

Each unit of an edible fat or oil is made of one molecule of glycerol in chemical combination with three molecules of fatty acids. Glycerol is a slightly sweet, rather syrupy, colorless liquid; fatty acids have a slightly acid or sour taste. They are composed most often of long, rather than short, chains of tiny units, each made of the element carbon combined with hydrogen. About forty different fatty acids are found in the edible fats and oils.

Chemists classify fatty acids into three different types called saturated, monounsaturated, and polyunsaturated. The saturated fatty acids are saturates because their chains contain all the hydrogen that they can hold. The monounsaturated fatty acids have in their chains one place where more hydrogen can be taken up when the acids are exposed to hot, compressed hydrogen, in the presence of a catalyst, a substance that speeds up a chemical change. This particular process is called HYDROGENATION. The third type of fatty acid is the polyunsaturated; this acid has two, three, or even four places in its chain where it can take up more hydrogen.

'Poly' is from the Greek word meaning 'many.'

The different fats and oils contain all three types of fatty acids but differ greatly in their percentage of each, which, in turn, affects their texture. The meat fats such as beef, pork, lamb, veal, lard, and butter, contain a high percentage of saturated fatty acids and a low percentage of unsaturated ones. Until heated, all these meat fats are fairly firm. Chicken and fish fats are somewhat softer, and contain a considerably higher percentage of polyunsaturates and less of the saturates than do the meat fats. This would suggest that the higher the percentage of the polyunsaturates, the softer the fats. The fact that nearly all the vegetable oils such as corn oil, cottonseed oil, soya oil, and sunflower seed oil, are all liquid and all high in the polyunsaturates would confirm this suspicion. Peanut oil is not as high in the polyunsaturates as the others. Olive oil, although liquid, has little of the polyunsaturates in it; oddly enough, it does contain a high percentage of the monounsaturates. Another exception is coconut oil which is high in saturates and low in polyunsaturates.

If a vegetable oil contains 40 percent or more of the polyunsaturated fatty acids and 20 percent or less of saturated fatty acids, this can be stated on the product label.

THE THREE TYPES OF FATTY ACIDS
IN VARIOUS OILS AND FATS

	Approximate Percentages		
	SATURATED	MONO-UNSATURATED	POLY-UNSATURATED
FATS			
Beef *Pork* *Lamb* *Veal* *Butter*	40-60%	40-55%	3-10%
Lard	30%	55%	15%
Chicken	32%	43%	25%
Fish	25%	16%	59%
OILS			
Olive oil	12%	80%	8%
Peanut oil	20%	49%	31%
Corn oil *Cotton seed oil* *Soya oil* *Sunflower seed oil*	12-25%	20-30%	50-70%
Coconut oil	92%	7%	1%

SOURCES OF FATS

Fats do play several important roles but they are present in so many of our foods that North Americans eat far too much of them. Some foods consist entirely of fat: the vegetable oils, lard, and vegetable shortening. Others, like margarine, butter, and commercial mayonnaise, are about 80 percent fat; most of their remaining weight is water. As one would expect, all of these foods are high in calories. Since peanut butter and the common nuts are about 45 percent or more fat, they too qualify as high-calorie foods. In meat, the amount of fat varies with the cut and the kind of meat. Choosing the leaner cuts of beef can reduce the calorie count by about 50 percent. Avoiding the visible fat in other meats also reduces the number of calories. Many other foods contain smaller amounts of fat. Raw milk from the cow is about 3 1/2 percent fat.

◗ *To test for fats, put a lump of margarine or butter about the size of a small pea on a piece of non-shiny wrapping paper. After a few minutes, scrape off the fat and hold the paper up to the light. What do you see? Put a drop of vegetable oil on the paper. Does it have the same effect? Have you ever noticed this phenomenon with other foods?*

FAT CONTENT OF FOODS

100%	*corn oil, and other vegetable oils, lard, shortening*
80%	*butter, margarine, mayonnaise, salt fat pork,*
45-75%	*side bacon, nuts, peanut butter,*
10-40%	*potato chips, chocolate bars, cheese, meat (fat incl.), doughnuts, french fries, cream, ice cream, cookies, pies.*

Chocolate bars are quite high in both sugar and fat content. A plain milk chocolate bar has 225 calories, milk chocolate with nuts, 240 calories.

MAKING MARGARINES AND VEGETABLE SHORTENINGS

Nearly all margarines are made of vegetable oils or mixtures of vegetable and marine oils, such as herring or seal oil. Margarine, of course, is far firmer than any of these oils. Manufacturers make margarine firmer by the hardening or hydrogenation of the oils, stopping the process when the suitable degree of firmness has been reached. The hardening effect is due to the increase in the percentage of saturated fats.

To give margarines a butter-like flavor and aroma, practically all types of margarines contain 1.4 percent of skim milk solids which is equivalent to about 14 percent of liquid skim milk. To achieve this effect, the diluted milk solids must be changed into buttermilk. This change is the result of adding harmless acid-forming bacteria and allowing them to multiply for some hours at a carefully controlled temperature. The acidified mixture is then whipped into the hardened margarine oils.

Some margarines contain liquid corn oil, as the label would indicate. If a margarine contains 25 percent or more of polyunsaturated fatty acids and not more than 20 percent of saturated fatty acids, this can be stated on its label. From the point of view of health, these types of margarine, especially the soft ones, are preferable because they contain a higher percentage of polyunsaturated fatty acids. It should also be noted that the vegetable oils and margarine or mayonnaise made with such oils contain generous amounts of vitamin E.

Margarines, especially the types containing a high percentage of unsaturated fatty acid, must be refrigerated both in stores and in homes. Both warmth and light increase their

All Canadian margarines have had sufficient vitamin A added to equal that of the year-round average of vitamin A occurring in butter. Some margarines also have some vitamin D added.

tendency to become rancid which results in an unpleasant taste and reduces their food value.

Vegetable shortenings are made from vegetable oils that have been hardened in the same way as in the manufacture of margarine, but to an even greater degree. They, therefore, contain a high percentage of saturated fatty acids.

THE THREE TYPES OF FATTY ACIDS IN MARGARINES AND BUTTER

	Approximate Percentages		
	SATURATED	MONO-UNSATURATED	POLY-UNSATURATED
One type of soft margarine containing liquid corn oil	18%	47%	35%
One type of margarine containing liquid corn oil	18%	55%	27%
Margarines, regular	24%	58%	18%
Butter	60%	35%	5%

Attention is paid to the fat-rich foods in the diet for reasons other than their high calorie counts. Nearly every day, the newspapers report the death of a person from a heart attack. Most often this is the end result of the condition known as coronary heart disease. The underlying cause of coronary heart disease is a certain type of hardening of the arteries that is called arteriosclerosis. In arteriosclerosis, firm raised patches develop on the inner lining of the arteries. As these patches grow in size, the lumen, or opening in the centre of the artery, becomes narrower. In this narrowed, roughened area, serious trouble occurs when the blood forms a clot and completely blocks off the blood flow in that artery. If the blockage occurs in an artery that supplies some of the muscles of the heart itself, those particular heart muscles are deprived of their urgently needed blood supply. As a result, the muscles are seriously damaged, sometimes with fatal results.

Because this disease is so common in industrially developed nations, physicians have been studying the problem. They have found that the people who most often develop this disease usually have been obtaining a high percentage of their calories in fats of animal origin. Many also have been eating overly generous amounts of very sweet foods and have been exercising their muscles very little. Very often they are overweight and have too much fat and also too much of a substance called cholesterol in their blood.

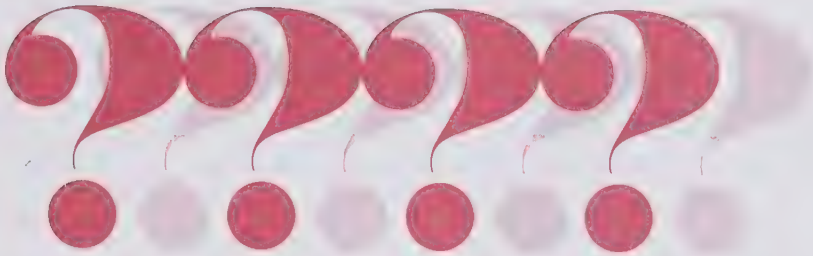
Several other factors such as heavy cigarette smoking, excessive stress, and the rapid pace of modern life, probably play some part in the development of this disease. However, many physicians believe that if people would develop the habit of eating less fat, of using a higher percentage of the unsaturated fats, and of continuing to participate in physical activities, the chances of their developing dangerous degrees of arteriosclerosis would be reduced. Also fewer would become fat.

The skin problem which causes greasy skin, blackheads, and pimples, is called acne. Its underlying cause is probably an overproduction of some of the hormones during adolescence. As a consequence, the skin sheds excessive numbers of cells from its surface. The oil glands, which empty oil into the sheath surrounding each hair, produce too much oil. Clumps of cells, matted together with oil, plug the openings around the hairs to form blackheads and later, if infected, develop into pimples. The skin is greasy but this probably has no connection with the amount of fat eaten. In a very few instances, certain foods may make acne worse; chocolate, cola drinks, nuts, and peanut butter are most often blamed.

DIGESTION OF FATS

The digestion of fats does not begin until they enter the first part of the intestines. Bile, which is made by the liver, flows down a small pliable tube connecting the liver to the intestine. Bile breaks up the fats into tiny droplets upon which the fat-splitting enzymes can act effectively. These enzymes are in both the digestive juice produced by the lining cells of the intestine and in the pancreatic juice. Sometimes, these enzymes split off all three of the fatty acids; sometimes, only two of them are split off before all resulting fragments are absorbed into the bloodstream. The fragments are turned back into fats again soon after absorption.

Mineral oil, also known as liquid paraffin, is not a fat or a food substance. It has no food value because the body cannot absorb it. In fact, if taken with or soon after meals, it causes loss of some of the important vitamins, such as vitamins A, D, E, K, and carotene. This loss is a result of fat-soluble vitamins and carotene dissolving extremely readily in mineral oil. If mineral oil or medicines containing it are advised as a laxative, one should take them at bedtime. By that time, most food eaten has been digested and absorbed and is no longer in the digestive tract. Therefore, the oil as it passes through the tract comes in contact with very little food.



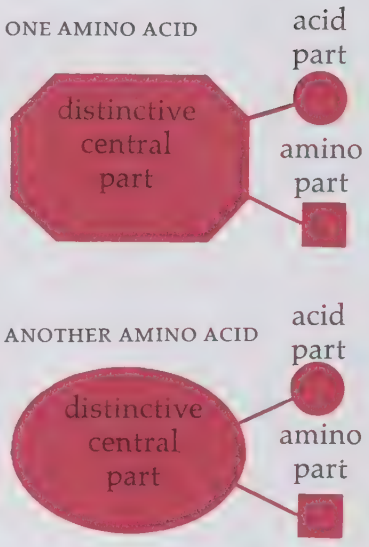
1. Answer true or false and give reasons for your answer.
   a) Margarines, especially those high in polyunsaturates, are more healthful foods than butter.
   b) Sugar and 100-percent fats are equal in calories per ounce.
   c) Baked or boiled potatoes are high in fat and, therefore, high in calories.
   d) Olive oil is the best type of vegetable oil.
2. Discuss the differences between butter and the different types of margarine and mention the advantages that some have over the others.
3. Discuss the advantages of broiling rather than frying meat.
4. Make a list of the names of the vegetable oils or mixtures of them you can find on grocery shelves. Which ones show the percentages of the polyunsaturated and saturated fatty acids that they contain? Try to find out why this is not listed on some of them.
5. Look for the margarines that give the percentages of saturated and polyunsaturated fatty acids on their labels. What are their names and their percentage figures?
6. Would you use a recipe for a low-calorie salad dressing that included mineral oil?

6 Proteins

Proteins are essential to life. Every living thing, whether plant or animal, contains proteins.

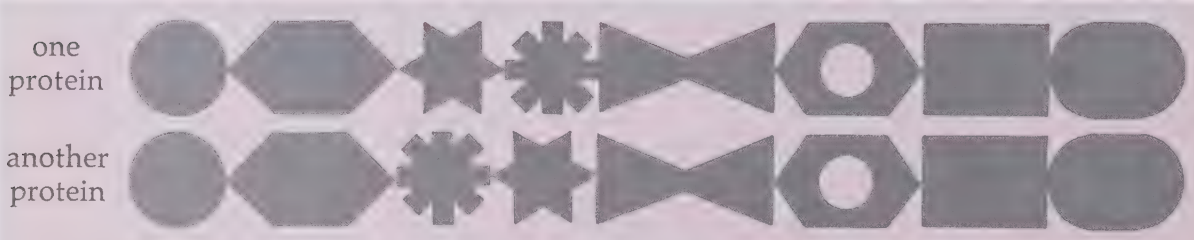
COMPOSITION OF PROTEINS

A protein is made up of a great many simpler units or molecules, called amino acids, which are joined together. In a protein, the amino part of one amino acid joins with the acid part of the next amino acid. This repeats until there is, in the simplest types of protein, a long chain of amino acids. Any one particular protein always has the same amino acids arranged in the same order. If only two of the amino acids in each of two chains were to exchange places, the result would be two different proteins. The chain may be zig-zag in shape, or coiled, or intertwined in various ways. Myoglobin, one of the common proteins in meat, is made up of 150 amino acids; many of the different amino acids that are in myoglobin are often repeated many times along the course of the chain. More than 100,000 different proteins are made in the body.



The structure of amino acids

This is a simplified diagram of a small part of a protein. Proteins consist of a great many different amino acids, some of which are represented by these symbols. Notice that, in this diagram, no two of them are the same.



In this diagram of small parts of two different proteins, the amino acids are represented by symbols. Interchanging just one pair of amino acids results in a different protein. There is an enormous number of possible combinations in the long chains of amino acids that make up proteins.

When proteins in food are eaten, they are split up into single or sometimes pairs of amino acids in the digestive tract. Twenty different amino acids are obtained from the proteins in foods. Whereas carbohydrates and fats contain only the elements carbon, hydrogen, and oxygen, the proteins always contain nitrogen, too. Many of them also contain sulphur; some have phosphorus or other elements in them as well.

Proteins are:

- ☐ *essential to life*
- ☐ *found in all living things*
- ☐ *made of long chains of amino acids*
- ☐ *are broken, in digestion, into amino acids and carried to body cells by the blood to be built into different proteins*

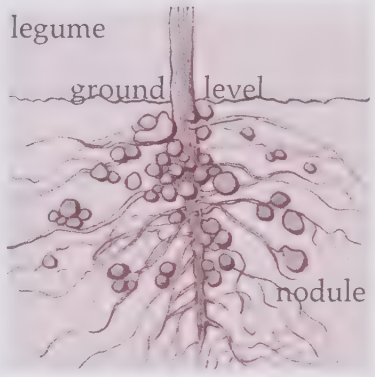
Essential and Non-essential Amino Acids

Some years ago, chemists were finally able to prepare pure samples of the twenty different amino acids that are found in food proteins. They then fed a suitable amount of an appropriate mixture of all these twenty pure amino acids, instead of protein, to young growing rats. The rats, of course, were given enough carbohydrates, fats, minerals, vitamins, and water as well. The chemists found that, unless the rats were fed enough of each of ten particular amino acids, they could not grow. These ten amino acids, necessary for growth, could not be made by the rats themselves. Therefore, these ten different amino acids were named the 'essential' amino acids. The chemists call the other ten, the 'non-essential' amino acids. They found that if they gave the rats enough of one of the non-essential amino acids, the rats could make enough of the remaining nine non-essential amino acids from it and other substances.

SOURCES OF PROTEINS

Plants are the primary source of all proteins; using much simpler substances, they can actually make amino acids. No animal is able to do this. To build these amino acids into proteins, plants use water, carbon dioxide from the air, and simple nitrogen-containing substances such as nitrates from the soil. Legumes, a certain type of plant which includes beans, peas, lentils, and peanuts, can also make use of the nitrogen gas that is present in the air found in the soil. In nodules on the roots of legumes, certain types of bacteria change the nitrogen gas into a usable substance.

The mature legume seeds thus have a higher content of protein than the other vegetables. Unfortunately, uncooked dry beans, peas, or lentils are not edible and, when boiled, they absorb a good deal of water and, therefore, the percentage of protein in them falls. In contrast, since they are eaten uncooked, peanuts and peanut butter provide very generous amounts of protein.



This illustration shows the bacteria-containing nodules on the roots of the legume — here, on a soybean plant.

PERCENTAGES OF PROTEIN IN FOODS	
roasted peanuts or peanut butter	25%
cooked lima or pea beans	6%
cooked lentils	6%
cooked peas	5%

Of the vegetables, the mature legumes (such as peanuts, beans, lentils, and peas) are highest in protein. The other vegetables contain 1 to 4 percent protein.

Only one animal protein, gelatin, does not contain all of the essential amino acids. It is called an 'incomplete' protein. All other food proteins of animal origin are 'complete' in that they provide good amounts of the essential amino acids.

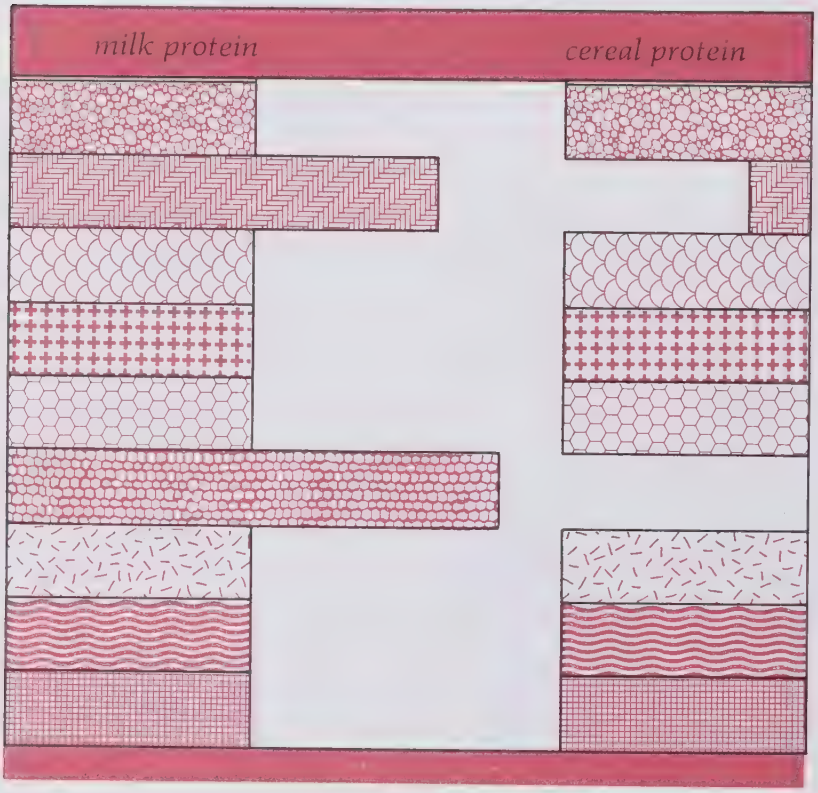
Nearly all the proteins of plant origin — grains, vegetables, nuts, and fruits, are missing one or more of the essential amino acids. They are described as incomplete proteins, too. However, the complete animal proteins, such as those in milk, meat, fish, and eggs, can be combined in one meal or snack with the incomplete plant proteins, such as those in breads and cereals. In this way, all of the essential amino acids may be obtained. Amino acids, though, cannot be saved from one meal to the next.

Fortunately, the different plant proteins vary in the essential amino acids that they lack or are low in. Wheat flour, for example, is low in one essential amino acid contained in mature beans; if baked beans are eaten with bread, the combination provides all the needed amino acids.

Animal proteins usually contain a higher percentage of protein than do the plant proteins. A disadvantage of animal proteins, however, is that they are relatively costly. Animals are far more expensive to raise than are plants. The least expensive source of complete animal proteins is skim milk powder.

A lunch of rolls with jam, an apple, and a soft drink has no animal proteins. If milk were the beverage or if such foods as meat, fish, or cheese were eaten with the rolls, both the plant proteins and the animal proteins would be available for body building and maintenance.

PERCENTAGE OF DAILY PROTEIN QUOTA	
one egg	8%
1 cereal and 4 slices of bread and 1 cake or muffin	22%
1-3 oz serving of meat, fish, or poultry	30%
32 ounces of milk	40%
total	100%



In the bar graph left, the lengths of the right bars show the amounts of each of the 9 essential amino acids in a plant protein, cereal. The cereal protein contains very little of amino acid #2 and none of amino acid #6. The left bars represent an animal protein, milk, which contains large amounts of both amino acids #2 and #6. The complete animal protein can, therefore, make up for the deficiencies of the incomplete plant protein.

PROCESSING AND ITS EFFECT UPON PROTEINS

Unlike the fats, most proteins show changes both in their appearance and in their consistency when they are heated at relatively low temperatures. This change effect of heat on proteins is called COAGULATION.

An acid substance added to a protein may also make it coagulate. Most fruits and vegetables contain small amounts of various acids. When the milk used in making scalloped potatoes curdles, the proteins in the milk have coagulated. The heat of an oven also partly accounts for curdling; if a lower oven temperature is used, there will be less curdling.

Since proteins are easily affected by heat and acids, it is fortunate that coagulated proteins can be digested quite efficiently.

If egg whites are beaten, they become foamy. If beaten long enough, they become quite stiff because their proteins have partially coagulated. If then heated in the oven, as in the making of meringues, the beaten whites become even firmer due to complete coagulation.

If a raw egg is placed in cold water and heated, the almost transparent white changes into a soft opaque solid when the water reaches a temperature of about 140° Fahrenheit. If the heating is continued, the white becomes firmer.

◗ *If you hold a small strip of the lean part of a strip of bacon in tweezers to burn it in a candle flame, do you notice a smell like burning hair? Ammonia and other substances containing the element, nitrogen, are produced when meat is burned. This accounts for the characteristic smell of burning protein. Try the same test with a small piece of hamburger beef and a piece of sardine.*

FUNCTIONS OF PROTEINS

Each body cell is able to take into itself the amino acids that it needs from the fluid surrounding it. Some of the amino acids it takes in are used internally for structural purposes when the cell is growing in size. However, many of the amino acids are used for building up the numerous enzymes, which are also proteins themselves, that the cell itself needs in order to keep alive and to do its work. Other amino acids are used to make new cells to replace cells that have been shed. Cells from the outer layers of the skin, for example, being continually rubbed off, have to be replaced. Even more remarkable is the fact that all the surface cells that make up the lining layer of the digestive tract, all thirty feet of it, are shed and replaced in the course of about two days. All the essential amino acids are needed to build and replace these lost cells.

Both digestive enzymes and mucus are proteins produced by the cells in the lining layers of the stomach and intestines. Thus, the cells that manufacture them need to be supplied constantly with amino acids. Certain cells in the pancreas produce insulin, which itself is a small protein; these insulin-producing cells need enough of the right amino acids in order to produce insulin.

Amino acids are needed by the special cells that manufacture antibodies, which are also proteins. After injections of vaccines or toxoids or after suffering disease itself, the body is immunized by these antibodies.

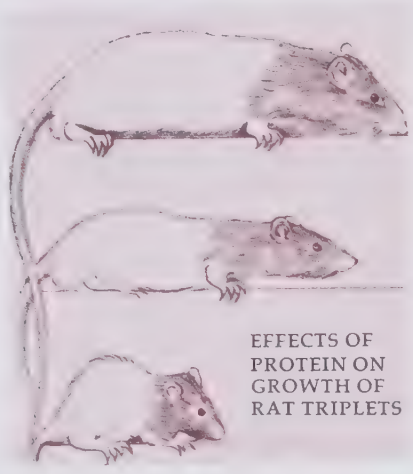
To do its work properly, plasma, the fluid part of blood, must contain enough of several special proteins; the red blood cells need enough of certain others.

Suitable proteins must also be eaten in order to supply the necessary amino acids to the cells that heal cuts after an injury.

If more proteins than are needed are eaten, the body removes the amino parts and uses the rest as a source of calories. However, before they can be used as a source of energy by the body, excess proteins have to be

Protein is necessary for:

- ☐ *growth*
- ☐ *energy*
- ☐ *replacing cells that have been shed*
- ☐ *repairing injuries*
- ☐ *making enzymes inside cells*
- ☐ *making digestive enzymes*
- ☐ *making antibodies*
- ☐ *making mucus*
- ☐ *making the proteins in the blood and other body fluids*

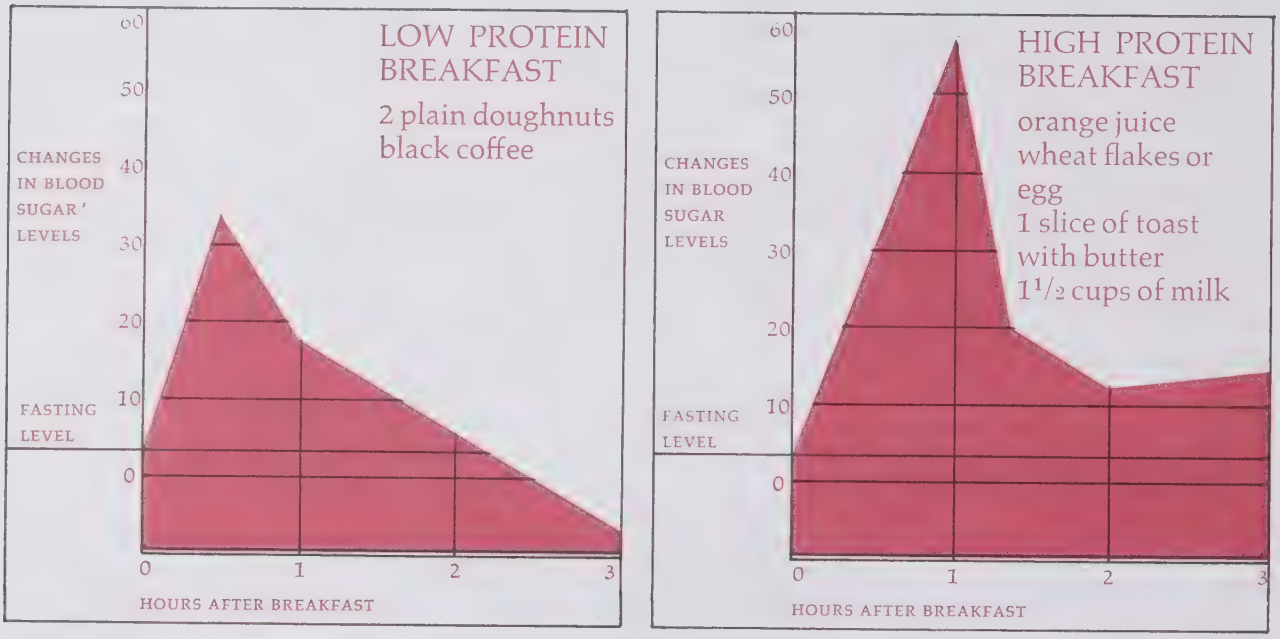


EFFECTS OF PROTEIN ON GROWTH OF RAT TRIPLETS

From birth, these triplets were given all the food they would eat. All received good amounts of carbohydrates, fats, minerals, vitamins, and water.

Diet #1: enough protein
Diet #2: one-half as much protein as #1
Diet #3: one-quarter as much protein as #1

changed into glucose, and this process occurs rather slowly inside the body. Consequently, if one eats a fair amount of protein in a breakfast such as milk, cereal, and toast, with cheese or eggs or sausages or bacon, gradually enough glucose is liberated to keep the amount of it in the blood at a good level for about four hours. If one only has black coffee and a couple of doughnuts for breakfast, the level of blood glucose will rise at first but within two hours will fall to quite a low point. A low blood glucose level may make one feel tired, hungry, and even cause headaches.



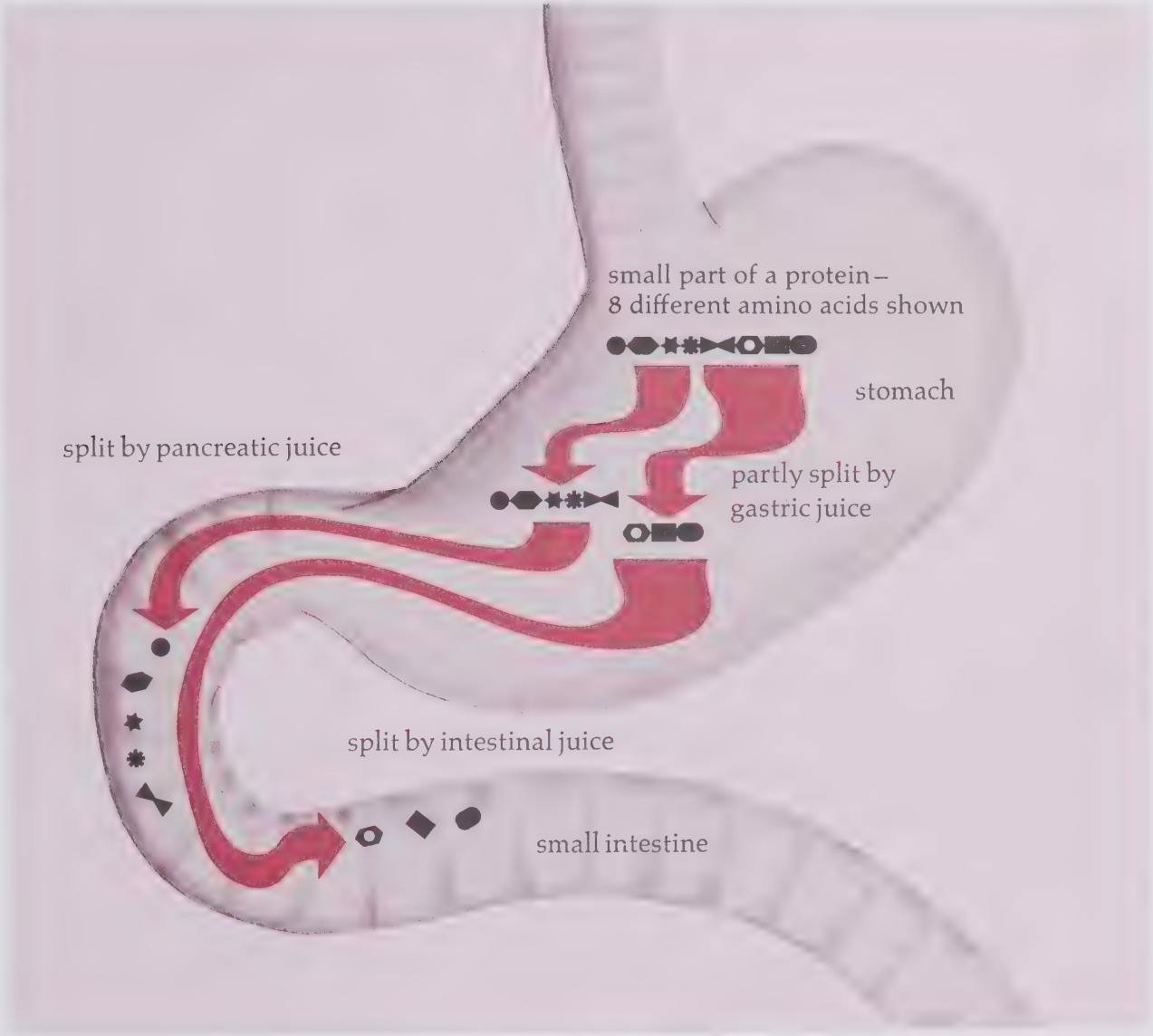
The amount of protein in a breakfast affects blood sugar levels and, thus, morning energy. A low-protein breakfast results in tiredness and too low blood sugar levels, two hours after eating. A high-protein breakfast maintains energy and higher blood sugar levels throughout the morning.

In many developing countries, complete proteins are in short supply. Babies, in particular, are affected when they are weaned from the breast and only fed cereal gruels. Such foods provide only small quantities of incomplete proteins. As a result, many thousands of these young children develop the serious and often fatal disease called kwashiorkor. This disease causes severe damage to the liver, stunts growth, results in dropsy, diarrhoea, and in many other abnormalities. Yet, if as soon as possible, an affected child is fed mixtures of dried skim milk and water to which suitable other foods will soon be added, the disease can be cured. However, many people in the poorer countries cannot afford to buy dried skim milk or other foods rich in animal proteins. For this reason, physicians and nutritionists, in areas where this disease is prevalent, have developed special mixtures of plant foods that together provide all the essential amino acids. To be accepted, these mixtures must be similar to the kinds of food these people commonly use, and they must be inexpensive enough for them to buy.

DIGESTION OF PROTEINS

When proteins reach the stomach, an enzyme in the stomach juice splits the long amino acid chains into shorter chains. The shorter chains soon move into the small intestine where enzymes in the intestinal and pancreatic juices break them down still further. Finally, the proteins are reduced to single amino acids or pairs of them. Absorbed from the intestines, these then enter the bloodstream which carries them all over the body. From the tiny blood vessels, the amino acids enter the film of fluid that surrounds the body cells and then enter the cells themselves, which use the amino acids to build their own proteins.

The amino acids are represented by symbols in this very much simplified diagram of protein digestion.



1. Answer true or false and give reasons for your answer.
   a) A person doing heavy work needs more protein than one doing light work.
   b) An athlete in training should always eat meals high in protein.
   c) The proteins in milk are complete.
   d) Peanuts and peanut butter contain more protein than any other food of plant origin that is eaten without cooking or extensive processing.
   e) Only plants can make proteins from very simple nitrogen-containing substances.
   f) It is beneficial to eat some proteins of animal origin in every meal.
   g) Dried skim milk is the least expensive complete protein.
2. How would you describe amino acids? Of what nutrient are they the building blocks? How did nutritionists show that certain amino acids could not be made by young growing rats and what were these particular amino acids called? What were the other amino acids called?
3. Describe briefly how proteins are digested and the many different ways in which the body cells use the amino acids that are brought to them by the blood.
4. What part do plants play in the world's supply of proteins? What are some of the legumes that we eat? Why do legumes contain more protein than other plant foods?
5. What is meant by coagulation? Why is it helpful to add a little vinegar to the water in which you are going to poach an egg?
6. Find out what you can about Fish Protein Concentrate (FPC). It is made in Canso, Nova Scotia and has been treated so that it has absolutely no fish taste.
7. Why are extra-generous amounts of protein recommended when an individual is growing, pregnant, or breast-feeding?
8. Discuss the food needs of athletes who are in training. Some coaches restrict the use of certain foods while others advise the consumption of some unusual products. Find out which practices result in improved performance.

7 Minerals

At least sixteen different minerals – the essential minerals, are needed for health. Fortunately, only two of these essential minerals, calcium and iron, must be remembered in choosing foods for meals and snacks. Although there is very little fluorine in our foods, a tiny amount added to water is valuable; iodine is obtained in the use of iodized salt. The remaining twelve essential minerals are commonly distributed in foods.

DIGESTION OF MINERALS

All the minerals eaten in foods are combined with other substances to form compounds. Sodium and chlorine, for example, occur in table salt, a compound called sodium chloride. During digestion, all the mineral compounds are separated out from the food containing them and, if necessary, the mineral compounds are altered so that they will dissolve in the watery, digestive juices. Afterwards, they are absorbed, passing into the bloodstream.

CALCIUM

Functions of Calcium

IN BONE AND TOOTH GROWTH

There is more calcium in the body than any other mineral and nearly 99 percent of all calcium is in the bones and teeth.

Many months before birth, a baby's bones begin to form. At first, they are miniatures of what they will be and are made entirely of a rubbery, gristle-like substance called cartilage which contains much protein. A short time later in the life of an unborn baby, mineral salts, containing both calcium and phosphorus, begin to be deposited in an orderly way in certain parts of the cartilage and bones.

Phosphorus, another of the essential minerals, also plays an important part in the building of bones and teeth. It is found in many common foods such as meat, fish, beans, flour, cereals, eggs, and to a lesser extent, in fruits and other vegetables.

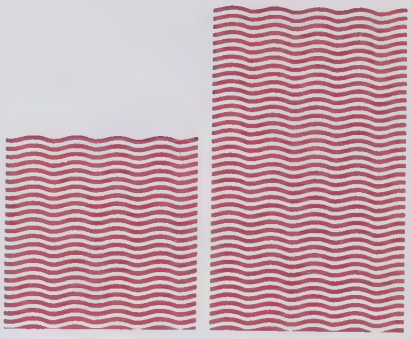
At the time of birth, some of a baby's bones are partly cartilage, partly bone, but many of the small 'bones' are still entirely made of cartilage. As a result, the body of a baby is flexible, making birth easier both for the baby and for the mother. During the first year, a baby grows surprisingly quickly. By one year of age, a baby has grown about ten inches in length, or about 50 percent longer than at birth. For all this bone growth, a baby needs bone-building foods. Fortunately, milk, which is the mainstay of a baby's meals, is an excellent source of calcium, phosphorus, and complete proteins.

Except for baby growth, adolescent growth of bones, both in length and width, is the fastest of any age. Each day, those persons between the ages of 11 and 17 need about 70 percent more calcium than when they were seven years old. Milk and most foods made from it build strong, well-developed bones; however, butter, although it is a milk product, does not provide calcium, phosphorus, or protein.

Muscular activity is of value to bones. Doctors have found that broken bones unite more quickly and strongly when exercised, probably because more calcium-containing blood can be carried to them as a result of this activity. Often, after people have broken leg bones, doctors, when possible, put them into walking casts. Such casts hold the broken leg bone in place but allow the patients to walk. Doctors also have found that when an injured leg has to be kept still for some weeks, its bones lose some of their calcium. People who use their legs and arms a good deal have stronger, that is, better calcified, bones than those of relatively inactive people.

Besides serving as the framework of the body, the skeleton is the storehouse for calcium, some of which is removed and replaced every day. Some is lost from the body daily, so calcium is needed even after growth has stopped. The bone storehouse helps to maintain the critical level of blood calcium.

AMOUNT OF CALCIUM NEEDED



7 years 12-17 years

In the body, bones act as:

- ☐ *the supporting and protective framework*
- ☐ *the attachments for muscles*
- ☐ *the storehouse of calcium*
- ☐ *the main blood-building centres (located in the marrow of certain bones)*

IN THE BLOOD

The calcium present in the blood also has several essential functions. The heart, for example, must be supplied with enough calcium in order to keep on beating. Blood calcium helps to keep nerves responsive to various stimuli such as light, sound, and touch. Calcium is also one of the many substances that must be present in blood if the complicated process known as clotting is to occur. Clotting helps to prevent severe bleeding when the body is cut or injured. Finally, some of the many body enzymes need the help of calcium in order to do their work. Calcium in the membranes that surround each body cell enables the cell to take in its food supplies.

In the blood, calcium helps:

- ☐ *to keep the heart beating*
- ☐ *to keep nerves responsive to stimuli*
- ☐ *in the normal clotting of blood after injury*
- ☐ *the functioning of many enzymes*
- ☐ *each cell to take in food supplies, by its presence in the membrane surrounding the cell*

Sources of Calcium

Although small amounts of calcium are found in many other foods, milk and cheese are the best sources. The soft bones in fish such as sardines, canned salmon, or smelts can add a fair amount of calcium to meals.

ANY ONE OF THESE CONTAINS
1000 MG OF CALCIUM

5 oz. cheddar cheese
4 lbs. celery
5 lbs. cabbage
4 cups milk
17 lbs. beef

1000 mg

ABSORPTION OF CALCIUM

Because most calcium salts do not dissolve readily in water, calcium is a mineral that is absorbed with some difficulty. Vitamin D helps to overcome this, yet vitamin D is found in few foods. As milk is the main source of calcium, it is the most logical food to enrich with suitable amounts of vitamin D.

The amino acids released when proteins are digested also help the body to absorb calcium. Therefore, meals and snacks providing much protein are of value in the absorption of calcium. Milk and cheese are again quite good sources of protein.

Nutritionists have discovered that strong emotion reduces the body's ability to absorb calcium from food. A generous supply of calcium will help to offset this effect.

To increase calcium in Canadian meals, loaves sold as enriched white bread must have 2 percent of dried skim milk added to the flour used for making them. This addition not only improves the texture of the bread, but also increases its food value.

IRON

Functions of Iron

The mineral called iron plays a tremendously important role in the body. The billions of red blood cells in the blood contain most of the body's iron supply, although a small amount of iron is a necessary part of every cell in the body, and there are stores of iron in the liver.

THE LIFE HISTORY OF A RED BLOOD CELL

Red blood cells are produced in the marrow, or central part, of certain of the bones. When each newly manufactured red blood cell is mature enough to do its work, it first makes its way into a blood vessel in the marrow and then into the bloodstream. This is a fairly arduous undertaking. Since the heart pumps the blood out into the blood vessels with considerable force, the tiny red blood cells bump into each other and against the sides of the blood vessels. When in the bloodstream, the red blood cells have to squeeze through vessels that are smaller in diameter than they are themselves. Each red blood cell lives about four months. By that time, worn out, it is removed and destroyed by other larger cells mostly in the liver and in the spleen. The iron saved from the broken-up red blood cells travels back in the blood to the bone marrow where it is used for making new red blood cells. Thus, in a healthy adult, the production and destruction of red blood cells is balanced.

Each red blood cell is shaped like a tiny pancake with a swollen edge. The cell is red because it contains a red-colored substance called haemo-

globin, consisting of a protein called globin, joined to a complicated substance called haem. Haem always contains a constant percentage of iron.

Haemoglobin has the remarkable ability to combine readily with oxygen where supplies of it are plentiful and also to release oxygen where supplies of it are scarce. Consequently, the red blood cells in the numerous tiny blood vessels in the lungs take on oxygen from the air inhaled, and carry this oxygen to all parts of the body. When the red blood cells reach the tiny blood vessels that wind in and out amongst the body cells, they release their oxygen to them. Cells need this oxygen in order to oxidize the simple substances from the food brought to them by the blood. In this way, cells obtain the energy that they constantly need. When a person's red blood cells do not contain their normal quotas of haemoglobin because there is not enough iron available to make it, the result is a lack of energy and little stamina.

By the constant rubbing off of the cells from the outer layers of the skin, the iron that these cells contain is lost. Similarly, there is continuous shedding of the cells lining the digestive tract and, here again, the cell iron content is lost.

If too little iron is eaten, the supply of haemoglobin is reduced and all the body cells are partially starved of oxygen. The cells then produce less energy and a feeling of tiredness results.

Girls or women having menstrual periods also lose iron. Women under forty-five years of age and adolescent girls, who have eaten too little of the foods rich in iron, may have low stores of iron or suffer from iron-deficiency anaemia. Anaemic blood contains too little haemoglobin. As one might expect, such people lack energy, and often feel tired. People with iron-deficiency anaemia are probably more susceptible to infections such as severe colds, the flu, and tonsillitis than are healthy persons.

With growth in height and weight, a larger amount of blood is required. In fact, for an increase of eleven pounds in weight, one additional pound of new blood must be produced. To make that much new blood requires considerable amounts of iron, complete proteins, and many other nutrients. In addition, the red blood cells that have finished their four months' work must be regularly replaced.

Sources of Iron

The following foods are especially rich sources of iron. The best sources are listed first: liver, particularly pork liver; ready-to-eat cereals that have been fortified with iron; meat, especially beef; poultry, and fish; raisins; eggs; whole grain porridges, especially rolled oats; enriched white bread and flour; whole wheat or rye bread; vegetables, especially legumes and cooked greens; and, other fruits.

"Iron deficiency affects a large proportion of Canadians. Since many women have an iron deficit during pregnancy, many babies are born with low iron stores and are not likely to attain normal tissue storage of iron if iron intakes subsequently remain marginal. Iron deficiency is usually considered to occur in infants and women. The survey findings show it to be a problem for men as well. The shortage of iron in the diet may be due to an increased consumption of refined foods and a reduced total intake of food. The use of aluminum and stainless steel cookware rather than iron vessels also eliminates a valuable source of iron. There is no doubt that our food supply is generally low in iron. . . ."

PROCESSING AND ITS EFFECT UPON IRON

Fortunately, heat does not damage iron; it is a very stable nutrient. Thus, the heat of boiling, baking, roasting, frying, puffing, flaking, or toasting does it no harm. Potatoes, for instance, when boiled in their jackets, retain most of their

iron, and when baked, lose none of it. However, some iron does leak out into the cooking water if vegetables have been peeled, cut into small pieces, or overcooked in excessive amounts of water.

ABSORPTION OF IRON

In the digestive tract, food is converted into a smooth, thin paste which is pressed against the lining layer of the tract by the alternating contraction and relaxation of the muscles of its wall. The iron in food, in the form of iron salts, is not readily absorbed into the bloodstream. Vitamin C-containing foods, such as citrus fruits or their juices, vitaminized apple juice, and tomato juice, may help in the absorption of iron.

IODINE

Functions of Iodine

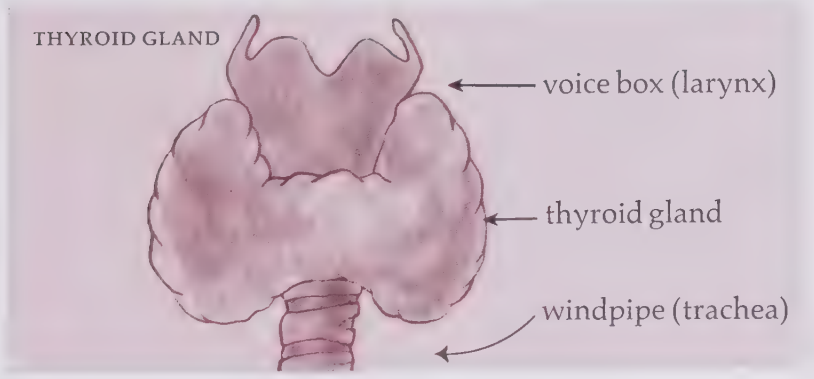
The thyroid gland is a small organ that weighs about one ounce, and is located at the front of the base of the neck; its shape is something like that of a thick butterfly. The hormone produced by the thyroid gland contains a high percentage of iodine. If the thyroid gland is not supplied with enough iodine, it enlarges. This increase in size results in a simple goitre, and it is seen as a thickening of the neck. This change is most apt to occur in adolescent girls and, during the prenatal period, in pregnant women. Such enlarged thyroid glands are more likely to cause trouble later, either by becoming too active or too inactive.

The thyroid hormone is emptied into the bloodstream and it controls the speed at which all body cells do their work. This hormone acts much like the accelerator in a car. If too little of this hormone is produced, all the cells slow down. The heart, for example, beats too slowly. If too much of this hormone is produced, all the body processes speed up. Fortunately, except in a very few people, the right amount of this hormone is produced.

" . . . adequate amounts of iodine are consumed by children and adolescents . . . However, moderate thyroid enlargement is observed with clinically significant frequency in adolescent girls in the General Population. . . ."

The thyroid hormone:

- ☐ *controls the speed at which all the body cells work*
- ☐ *contains a high percentage of iodine*



Sources of Iodine

The best source of iodine is iodized table salt. Health food stores recommend the use of sea salt, which is made by evaporating sea water; yet, as sea water contains only a small and variable amount of iodine, all of which can be lost in the drying process, this type of salt cannot take the place of iodized salt. Although sea salt does contain other minerals, sufficient amounts of them are also found in other foods.

Iodized salt is needed as a supply of iodine for the thyroid gland. Its use helps to prevent the thyroid from enlarging and to keep it functioning normally. Sea salt is not a reliable substitute for iodized salt.

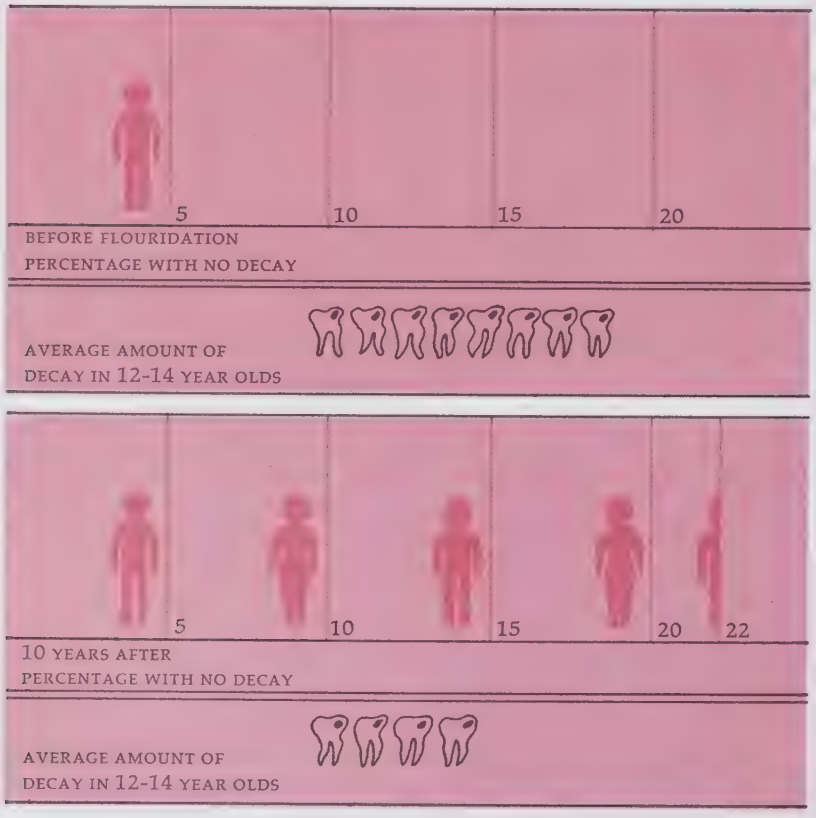
In some parts of Canada, sufficient iodine is present naturally in the water and the soil and, therefore, in the locally grown food. In other parts of the country, both the water and the soil contain very little iodine, as, for example, in a large area around the Great Lakes and in southern British Columbia. Consequently, foods grown in these areas are low in iodine.

To prevent any scarcity of iodine, all the salt sold for table or general household use must be fortified with a small and accurately controlled amount, 0.01 percent, of potassium iodide. When salt has been iodized, the label must state this fact.

FLUORINE

Functions of Fluorine

Fluorine is now considered an essential substance. It makes tooth enamel harder and, therefore, more resistant to decay.



Tooth decay is sharply reduced by fluoridation of the water supply.

Sources of Fluorine

In the early 1940s, some alert dentists discovered that people living in a few towns in the American mid-west had far less tooth decay than did most other Americans. The dentists analyzed the water that these healthy townspeople used and found that it contained more than the usual amount of fluorine present in water.

Many well-planned studies since carried out, over periods of from ten to twenty years in Canada, the United States, and many other parts of the world, have shown that the use of water, containing one part of fluorine to every one million parts water, reduces tooth decay in the permanent teeth of children by about 60 percent. Municipal water fluoridation is the single most effective weapon against tooth decay. The benefits from its use in the growth period of childhood extend to adult life.

People who have private wells can also obtain a prescription from their dentists or doctors for a fluoride solution or for fluoride tablets to add to their water.

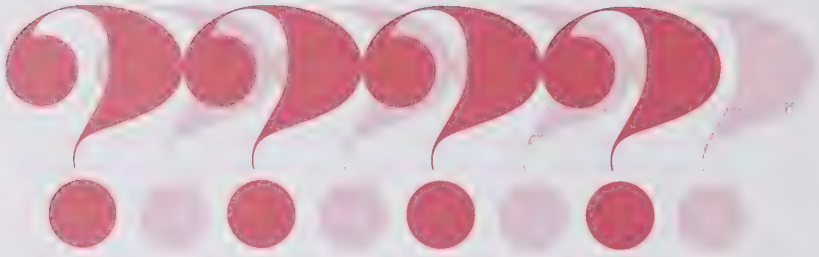
Some benefit from fluorides may also be obtained by having the dentist or dental assistant 'paint' a liquid containing a certain small percentage of a fluoride compound on all the teeth. Because this has to be done skillfully and be repeated at least once a year from the age of three to twelve years, it is far more expensive than municipal water fluoridation. However, it does reduce dental decay by about one-third. This method is often combined with the use of fluoridated water.

One may also profit from fluorides by using a toothpaste containing a fluoride compound. This was the first type of toothpaste to be approved by the American Dental Association as having real value in curbing tooth decay, but it is not nearly as effective as fluoridated water. It only reduces tooth decay by about 20 percent.

All of these methods used together give the best results.

A study of the effects of fluoridation was carried out in Brantford, Ontario. Before the study was started, only 5 percent of all the public and high school students in Brantford had teeth free from decay and the twelve to fourteen-year-old students averaged eight decayed teeth each. After using the fluoridated water for ten years, 22 percent had no tooth decay at all; and the twelve to fourteen-year-olds averaged four decayed teeth each.

All the official dental and medical organizations in Canada are unanimously in favor of the fluoridation of municipal water supplies. This method costs the taxpayer far less than does dental repair. Other methods of administering similar small amounts of fluorine are all more expensive and more difficult.



1. Answer true or false and give reasons for your answers.
   a) Iodized salt is the only kind to use.
   b) Coffee and soft drinks are almost as good foods as milk.
   c) Fluoridation of municipal water reduces tooth decay.
   d) Teenagers need plenty of iron in their food.
   e) Generous amounts of milk and cheese are helpful during adolescence.
2. What proof is there that bones are living matter, even in adults?
3. How do your bones serve you?
4. How does physical activity affect your bones?
5. Write a note describing the red blood cells under the following headings: their shape; where they are manufactured; two substances necessary for their production; their life expectancy and final fate; their function in the body; and, what you can do to help your body produce enough of these cells. If possible, have a medical laboratory technician, a doctor, or a nurse demonstrate how the amount of haemoglobin in the blood is measured.
6. Describe the functions of the thyroid gland and how you can assist it in its work.
7. Do some research on the early discoveries of the effectiveness of minute amounts of fluorine in the prevention of tooth decay. Try to find out how many Canadians are benefitting now due to the municipal fluoridation of their water supplies. In what other ways can fluorine be used to help preserve the health of your teeth? What are some other proved ways of reducing tooth decay?
8. Using food tables, compare the amount of iron in $1\frac{1}{2}$ ounces of raisins and the same amount of hard candy or marshmallows.
9. Either give a talk to your class or write a short essay on the functions of iron in the body, the results of eating too little of it, and the foods that are especially rich in it.
10. Read the labels on the ready-to-eat cereals you have at home to see which have been fortified with iron. Indicate how much iron each one contains; this is usually shown on the package per 100 grams. As 100 grams is almost exactly $3\frac{1}{2}$ ounces and as one serving of most cereals weighs 1 ounce, calculate how much iron the various cereals provide per serving. How does this iron content compare with that of an average hamburger?

8 Vitamins

Practically nothing was known about the vitamins until the early part of this century. At that time, it was generally thought that all the nutrients an animal or a human being needed were carbohydrates, fats, proteins, minerals, and water. This idea was proven false when Sir Frederick Gowland Hopkins, later a Nobel prize winner, showed that young rats fed only these five nutrients in pure form soon stopped growing and died. However, if, in addition, the rats were given half a teaspoon of whole milk each day, they thrived and grew well. Evidently, milk contained minute amounts of unknown essential substances. The fact that these potent substances were present in such tiny amounts was one of the main reasons why the vitamins were not discovered earlier. Eventually, piece by piece, the picture was filled in by investigators in many parts of the world.

Today, the scientists know that certain amounts of twelve different vitamins are needed each day. Luckily, if food is chosen to provide enough of five key vitamins, sufficient amounts of all the other vitamins will result, too. These five vitamins are vitamin A, thiamin, riboflavin, vitamin C, and vitamin D.

Young laboratory rats have been of great help to the nutritionists in their search for the functions of the different vitamins since, like human beings, rats eat both animal and vegetable foods; guinea pigs, too, have been very useful for studying the role of vitamin C in the human body. In one common type of test, two groups of rats from the same litter were fed identically except that one particular vitamin was excluded from the diet of one group. Such tests showed that the complete lack of any one vitamin had its own distinctive effect on the animals. The same effects occur in human beings who have lived for some considerable time on meals lacking one or more of the vitamins.

In tests with animals, the lack of certain of the vitamins was discovered to have the following results: (1) it can slow down the animal's growth, and eventually shorten its life; (2) it can prevent one or more of the animal's organs from developing normally; (3) it can prevent the animal from obtaining all the energy it needs from its food; and, (4) it can prevent parts of the animal's body from functioning normally.

MEASURING VITAMINS

The total weight of a vitamin, even in a food that is very rich in it, is very small. Similarly, the total weight of it that the body needs is very small. In other words, the vitamins are very potent substances.

Chemists have devised units of measurement for the vitamins. One unit commonly used is the milligram. One milligram is 1/1000 of a gram and one gram is 1/28 of an ounce. One gram of vitamin A contains 4,500,000 International Units (I.U.), another common unit used to state vitamin content. The term, 'International,' refers to the fact that a committee of experts, appointed by the League of Nations in 1934, met and agreed upon what a unit of vitamin A should be.

The term 'milligrams' is sometimes abbreviated to mgs, mgms, or mg. A gram is only one twenty-eighth of an ounce. One milligram is one thousandth of a gram, and is obviously a very small quantity. However, the vitamins are only needed in very small amounts and occur in foods in those tiny quantities.

Enough of the key vitamins can be obtained easily with the possible exception of vitamin D, in foods commonly available. Vitamin D is unlike the other four key vitamins in that the human body can manufacture it in the summer when the skin is exposed to sunlight. The other four key vitamins have to be eaten, preferably in foods, because they cannot be made in the body.

In the industrially developed countries and also in the World Health Organization (WHO) of the United Nations, official councils or committees have published tables showing how much of the various vitamins they recommend, each day, for children, adolescents, and adults. These recommendations are, in reality, intelligent guesses and they vary somewhat from one country to another.

Chemists and nutritionists have also measured the vitamin content of foods before and after storage, and after cooking them in various ways. They also have discovered what happens to the different vitamins when foods are commercially processed.

VITAMIN A

Functions of Vitamin A

When young weanling rats are fed a diet complete but for vitamin A, they grow for about three weeks. During this time they are gradually using up the vitamin A that they had previously stored in their livers while they were living on their mothers' breast milk. When this source is exhausted, they soon begin to lose weight. At about the same time, changes begin to appear in the moist, smooth cells that normally form the lining layer of their eyelids, noses, throats, and lungs. These layers become dry, almost like skin. The same kind of change occurs on the surface of their eyeballs. If such rats are given daily doses of vitamin A soon after these changes begin, they will start growing again and their eyes will become normal once more. If not, these changes become progressively more severe and the rats will become blind and die a few weeks later. Blindness in babies due to a lack of vitamin A is extremely rare in North America, but even today, some young children in South-East Asia and other tropical regions lose their sight due to a vitamin A deficiency.

A young animal whose diet lacks vitamin A also shows abnormal changes in the enamel of developing teeth and in the bones of the skull.

This same deficiency can also cause night blindness, an abnormally prolonged inability to see clearly in a dim light after exposure to bright light. If vitamin A deficiency is the cause of the night blindness, extra amounts of this vitamin in the form of liver or vitamin A-containing tablets will cure it. There are, however, other types of night blindness that are not caused by a deficiency of vitamin A.

Sources of Vitamin A

"[In the General Population, a] considerable number of adolescents, particularly girls (25%), consume inadequate amounts of . . . [vitamin A]."

Vitamin A value is obtained from food in two forms, as ready-made, 'pre-formed' vitamin A or, as carotene. Ready-made vitamin A is found only in foods of animal origin. Carotene is the only form of this vitamin in plants but it may also be present in foods of animal origin. Ready-made vitamin A is almost colorless while carotene has a deep yellow, carrot-like color. Carotene is similar, chemically, to two units of vitamin A joined together. Much of carotene can be changed into vitamin A in the body.

The vitamin A value of the food of many North Americans consists of about two-thirds carotene and one-third ready-made vitamin A.

Liver, whole milk, dried or fluid skim milk with vitamin A added, 2-percent milk, most cheeses, butter, margarine, and eggs are foods that provide a good supply of ready-made vitamin A. Liver is the best source since animals store this vitamin in their livers.

FOODS HIGH IN VITAMIN A

Liver	*Whole milk*	Whole Milk Cheese	Eggs
	2-percent milk	Butter	
	Dry skim milk fortified with vitamin A	Margarine	

One serving of liver supplies an entire day's vitamin A requirements.

All of the dark yellow-fleshed vegetables and fruits are rich in carotene, as are all the dark green vegetables, although their green chlorophyll masks the dark yellow color of the carotene. The darker the yellow or the green, the higher the vitamin A value. One serving, about half a cupful, of any of the foods rich in carotene will give a sufficient amount of vitamin A for an entire day.

FOODS HIGH IN CAROTENE

Cantaloup	*Carrots*	*Spinach*
Apricots	*Sweet potatoes*	*Beet greens*
	Winter squash	*Broccoli*
	Pumpkin	

A serving of any one of these foods will provide a day's supply of vitamin A.

PROCESSING AND ITS EFFECT UPON VITAMIN A

As vitamin A and carotene do not dissolve in water, neither of them escapes into the cooking water when foods are boiled. Because carotene dissolves readily in fat, any fat, such as meat fat, gravy, butter, margarine, or oil dressing in the meal, will act as a carrier for carotene and will help the body to absorb it. Boiling-water temperature does not reduce the vitamin A value of a food, but if one fries butter or margarine some of the vitamin A is destroyed by the high heat.

THIAMIN

Functions of Thiamin

Thiamin is an essential part of at least four different enzyme systems in every cell in the body. These enzyme systems help the cells to obtain their full quota of energy from the glucose that the bloodstream has brought to them.

In many Far Eastern countries, polished white rice provides some 80 percent of the daily calories. Such rice has had its bran, its germ, and its scutellum removed and, thus, has been robbed of most of its thiamin. In Eastern markets, the rice is often very dusty when it is bought and, therefore, it is washed in several lots of water before being cooked. These washings remove even more of the meagre supply of thiamin present in the rice. People who are forced, usually by poverty, to eat meals that are so low in thiamin, are likely to develop a deficiency disease called beri-beri. In adults, this disease can cause either wasting or dropsy of the legs and often even death from heart failure. For babies, the disease is usually fatal. Beri-beri is extremely rare in North America. In the Philippine Islands, efforts are being made to prevent beri-beri by enriching rice with suitable amounts of thiamin. This enrichment raises the price of rice and even this small extra cost prevents many of the people from buying it.

Sources of Thiamin

Thiamin cannot be stored, to any extent, in the human body, and so sufficient quantities of it must be eaten each day. Adolescents, for example, need to consume about one milligram in their food, daily.

The common foods vary considerably in the amount of thiamin that they contain. Some of these differences are due to the nature of the foods themselves; some differences are due to the type of food processing, others to the degree of enrichment or fortification.

The foods that are highest in thiamin are the lean parts of fresh and cured pork, heart, liver, and kidney, and the fortified ready-to-eat cereals. The other meats such as beef, veal, and lamb are considerably behind lean pork in thiamin value; the reasons for this are unknown. Some other foods containing fair amounts of thiamin are home-cooked whole grain porridge such as that made of rolled oats, whole grain bread, baked goods made of enriched white flour, milk, eggs, and vegetables, especially peas, beans, and potatoes.

PROCESSING AND ITS EFFECT UPON THIAMIN

Thiamin dissolves readily in water. When a ham is boiled, some 30 to 40 percent of its thiamin leaks out into the cooking water. People who make soup with this water save most of this vitamin. As a similar amount of thiamin escapes into the water in which vegetables are cooked, the cooking water, itself, is worth using. If vegetables are cooked gently in a small amount of boiling water just until tender, more of their thiamin content is retained. When baking soda is added to the water in which green vegetables are cooking, in an effort to retain the greenness, much of the thiamin is destroyed. If cooked until just tender, vegetables do retain their green color quite well.

The liquid in a can of peas usually contains as much thiamin as the peas themselves. If this juice is chilled, it makes quite a pleasant drink; it may be flavored with some tomato juice.

Thiamin is partially destroyed by high, dry heat; the higher the temperature and the longer the exposure to it, the greater the loss of thiamin. If meat is roasted at the relatively low temperature of 325° to 350° Fahrenheit, considerably more thiamin is saved than if the meat is cooked at higher temperatures. Lower heat also minimizes shrinkage.

In making white flour, millers remove the bran and the germ with its surrounding scutellum, from the kernels of wheat. As most of the thiamin in the unmilled kernels is in these three parts, the resulting white flour is very low in thiamin.

To compensate for the loss of thiamin, most of the white flour made in Canada is now enriched with thiamin as well as with two of the other B vitamins, riboflavin and niacin. White flour is also enriched with iron, since it, too, is mostly removed in the milling process. The label on a bag of enriched white flour indicates that the flour contains so many milligrams of thiamin, riboflavin, niacin, and iron in each 100 grams. As far as thiamin content is concerned, this means that the enriched white flour is now equal to whole wheat flour in this vitamin. While whole wheat flour is a little better food, nutritionally, than enriched white flour, the difference is slight. Since most Canadians prefer white bread and flour to the whole grain types, this program of government-controlled enrichment of white flour was introduced over 25 years ago.

All white porridges also are low in thiamin; the germ, the scutellum, and bran are removed from the wheat in the milling process. Rolled oats, rolled wheat, cracked wheat, and other dark whole grain porridge meals are all quite high in thiamin.

When cereal manufacturers convert whole wheat into any type of shredded wheat product, the violent processes they use destroy about 50 percent of its original thiamin. The flaking and toasting that is necessary to make ready-to-eat wheat flakes has a similarly harmful effect on this vitamin. If manufacturers use ordinary white rice, which has been robbed of its germ and bran, or degerminated corn – corn kernels with the germ removed, for making ready-to-eat cereal, they begin with thiamin-poor material as well. As thiamin, a delicate vitamin, cannot withstand being 'shot from guns,' puffed cereals, which have been treated in this very rough way, lose all their thiamin. As compensation for these losses, many of the manufacturers now add suitable amounts of riboflavin, niacin, and iron to cereal mixes and spray on thiamin at the end of the processing when the thiamin will not be destroyed. Because of this final treatment, these fortified cereals are far richer in thiamin than similar unfortified cereals. Baby cereals are also fortified in this way as are some brands of macaroni and spaghetti. The labels reveal whether or not the various products have been so fortified.

When enriched or whole grain flour is used in baking, a small percentage of its thiamin is destroyed in the crust, which becomes very hot. However, the temperature inside baked goods is about that of boiling water, a temperature which thiamin can tolerate. The thinner the baked goods, the greater the loss of thiamin since heat can penetrate them more easily. Toasting bread leads to an additional loss of 15 to 20 percent of its thiamin.

RIBOFLAVIN

Functions of Riboflavin

In much the same way as with thiamin, certain enzymes in body cells need the help of riboflavin in order to obtain the necessary energy from the glucose that the bloodstream has brought them.

Lack of riboflavin can cause flaking and redness of the skin around the corners of the nose and eyes and white patches at the corner of the mouth. Eating very little riboflavin can thus have a harmful effect on the complexion. In addition, the surface of the eyeballs may become bloodshot and tiny blood vessels may grow out into the cornea, the transparent 'window' through which one sees. The result of this is a sensitivity to sunlight, itchiness, and general discomfort in the eyes. These troubles can all be due to a riboflavin deficiency. Suitable amounts of pure riboflavin, which can be taken in tablet form, will relieve them, but using more milk will prevent them.

Sources of Riboflavin

Riboflavin is another important water-soluble vitamin. Any kind of milk, whether pasteurized, evaporated, or dry powdered, is rich in riboflavin. Whole milk, 2-percent milk, skim milk, buttermilk, and chocolate dairy drink are all equally well supplied with riboflavin. If one drinks the recommended four cups of milk daily, this one food will provide nearly all the riboflavin needed.

A serving of any kind of heart, liver, or kidney provides from two to six times as much riboflavin as one cup of milk, but few people eat these meats often. A serving of relatively lean meat, of one egg, of four slices of whole wheat bread or of enriched white bread, possesses little more than one-third of the riboflavin contained in one cup of milk. Most of the vegetables add only small amounts, although mushrooms, cooked greens, and peas are richer sources; the fruits are low in riboflavin. Milk, thus, remains the single best source of riboflavin.

One pint of milk gives you as much riboflavin as all of the rest of your day's food together.

PROCESSING AND ITS EFFECT UPON RIBOFLAVIN

Riboflavin can tolerate more heat than can thiamin. However, when cut-up vegetables are cooked in water, some of the riboflavin will leak out into the water. Obviously, it is worthwhile re-using the cooking water.

Oddly enough, riboflavin is quite easily destroyed by sunlight. If milk in a clear glass bottle is exposed even to winter sunlight for three hours, two-thirds of its riboflavin is destroyed. By selling milk in cartons or opaque plastic containers, dairies have helped to preserve the riboflavin content of milk. Fortunately, refrigerator light does not reduce the riboflavin level in milk.

THE OTHER B VITAMINS

The human body requires sufficient quantities of five other B vitamins, but these do not need to be taken in the form of pills, not even in the case of vitamin B_6. This entire group of B vitamins, frequently called the vitamin B complex, usually occurs together in a food although certain foods are especially good sources of one of them. Milk, for example, is rich in riboflavin; lean pork is a good source of thiamin, bananas of vitamin B_6. Ordinary foods supply enough of all of them.

If Canada's Food Guide is followed, enough of the vitamin B complex is easily obtained.

A few individuals, lacking a substance normally present in the stomach juice, are unable to absorb vitamin B_{12} and, as a result, develop an unusual type of anaemia called pernicious anaemia. This anaemia can be successfully controlled with periodic injections of vitamin B_{12}.

Niacin, or a similar substance called niacinamide, is the third B vitamin that is added to enriched white flour. Most of the niacin present in wheat is in the bran of the grain which millers remove when making white flour. Good sources of niacin include meat, poultry, beans, peas, peanuts, and peanut butter. Niacin can also be made in the human body from a surplus of one of the essential amino acids called tryptophan. The proteins in milk and eggs contain especially generous amounts of this amino acid.

Years ago, before methods of enriching white flour and corn grits were introduced in the United States, many poor people in the southeastern states were victims of pellagra, a disease due mostly to a niacin deficiency. Pellagra causes severe skin inflammation on the parts of the body exposed to the sun, diarrhoea and, finally, insanity if not discovered and treated. Today, pellagra is rare in the United States, partly because of the grain enrichment program and, partly because many of these people can now afford to buy more of the foods that contain niacin and tryptophan.

VITAMIN C

Functions of Vitamin C

Dogs, cats, rats, cows, sheep, pigs, and deer, and nearly all other animals, do not need to eat vitamin C in their food. They can make it in their own bodies from other substances. However, a few animals, including guinea

pigs, human beings, and the primate order of mammals such as monkeys and gorillas, have to obtain their vitamin C ready-made in the foods they eat. Being unable to make this vitamin for themselves, all will develop scurvy if deprived of vitamin C.

SCURVY AND VITAMIN C

In the days of the early explorers, thousands of sailors died of scurvy because they did not eat vegetables or raw fruits during their long voyages. Even when they were safely on shore or at home, their food often contained little vitamin C.

Jacques Cartier had serious trouble with scurvy on his second voyage of exploration to eastern Canada. His three small ships, the "Grande Hermine," the "Petite Hermine," and the "Emerillon," set sail from Saint-Malo, in the north of France, on the 16th of May, 1536. About two months later, Cartier and his men reached the St. Lawrence River and occupied a fort just east of what is now Quebec City. They had met the Indians in the area on their previous trip and were on good terms with them and so they decided to spend the winter there.

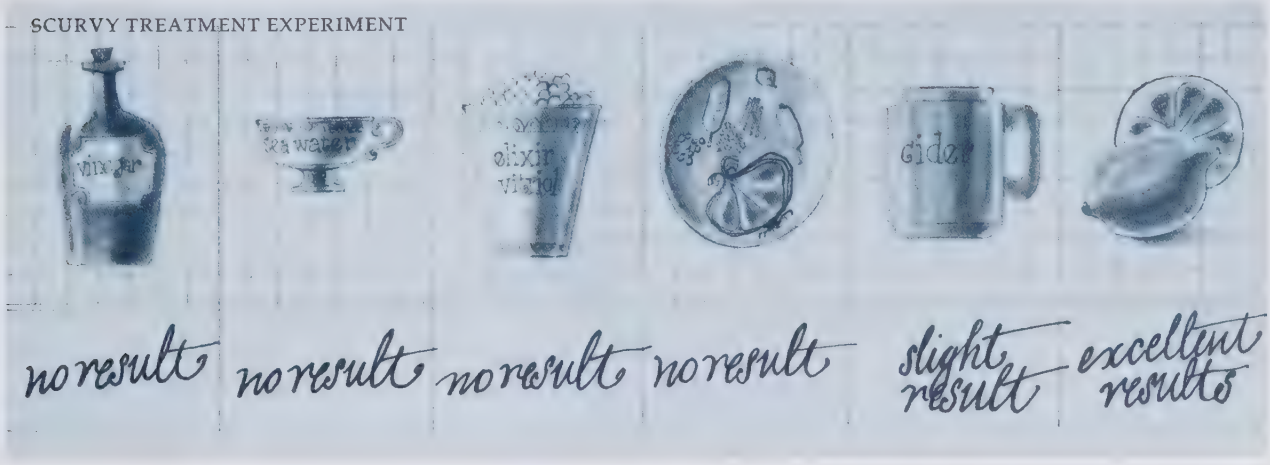
By December of the same year, disease broke out among the Indians. Fearing that it was infectious, Cartier drove the Indians away from his quarters and isolated his men. The disease, far from being infectious however, was scurvy and was caused by poor winter diet. By February, most of the sailors, too, had taken sick. Only three of Cartier's one hundred and ten men escaped it and twenty-five of them died.

One day, Cartier noticed that an Indian, whom he had seen very ill with the disease some ten days before, was now apparently quite well. When Cartier asked how he was cured, the Indian replied, "By the juice from the leaves of a tree," and sent two Indian women to gather a number of its branches. The women stripped the leaves from the branches, dropped them into a vessel of water, and boiled them. At first, Cartier's men were unwilling to drink the watery brew, but soon some, in desperation, decided to sample it. The effect of just a few doses of this drink quickly persuaded the others to follow suit and, in less than eight days, they had completely used up the foliage from a large tree. Undoubtedly, this Indian remedy saved the lives of Cartier and the remainder of his crew. Unfortunately though, many other sailors, both before and after this time, still perished miserably from scurvy.

The tree is thought to have been the common white cedar, but recent tests have shown that the needles or leaves of at least a dozen varieties of Canadian evergreens are all rich in vitamin C.

There is a story of a sailor on the Greenland ships in 1734 who was so ill with scurvy that his companions put him into a boat and took him ashore, leaving him there to die. Being unable to use his legs, the sailor could only crawl about the ground. This he found covered with a plant which he ate and which cured him. Upon his return home, he found that the miraculous plant was the herb, 'scurvy grass.' In fact, many other wild greens would have been equally effective.

James Lind, a Scottish physician in the Royal Navy, carried out the first scientific tests on the treatment of scurvy in the 1740s, he later described these in his famous book, *a treatise on the scurvy*. In one such test, the doctor took a dozen sailors sick with scurvy on board his ship, the "H.M.S. Salisbury." He divided the group into six pairs and, on each pair, he tried different recommended treatments. The sailors were given vinegar, or sea water, or elixir vitriol, or a mixture of garlic and other dried herbs, or cider, or two oranges and one lemon each day. The two men who were fortunate enough to receive the orange-and-lemon treatment recovered quickly. In fact, one was well enough to go back on duty after only six days and the other was kept busy nursing the remaining ten men. The cider seemed to slightly benefit the two men who were given it, but the rest of the so-called remedies were quite useless.



Despite these conclusive results, Lind's strong recommendation that all naval seamen be given lemon juice every day was not made compulsory in the British navy until the early nineteenth century when this preventive measure is thought to have helped the British greatly in their naval war against Napoleon. Lemon juice was called lime juice at the time, and British sailors were nicknamed "limeys" for many years.

In 1907, two Norwegian chemists discovered that guinea pigs fed a diet of dry cereal grains soon developed scurvy. They later devised a crude test for comparing how much vitamin C different foods contained by seeing how well each would prevent scurvy in these animals. In 1932, two German chemists, who were hunting for a method of distinguishing between fresh fruit juice and artificial substitutes, found a much simpler chemical test for measuring vitamin C content.

A short time before this German find, a Hungarian chemist, Albert von Szent-Györgyi, collected a small amount of a pure acid from hundreds of pounds of adrenal glands obtained from slaughterhouses. The adrenal glands of animals and of human beings, located just above the kidneys, produce many important hormones, among them, cortisone. Szent-Györgyi thought the acid he had isolated might be vitamin C, but he did not test his theory until C. G. King, an American chemist, obtained a very small amount of what he thought to be pure vitamin C from a very large quantity of lemon juice. Upon comparison, both the acid from the adrenal glands and that from the fruit juice were indeed vitamin C.

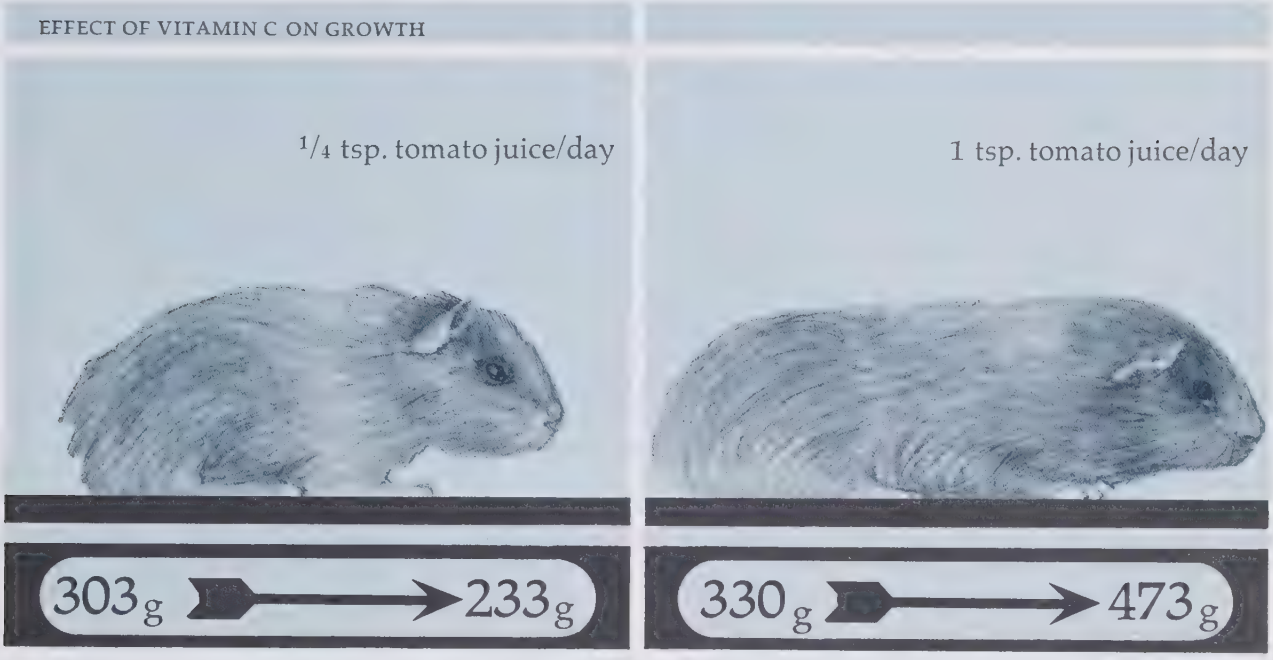
Analytical chemists still needed to obtain these crystals in large enough quantities so that they could work out the exact chemical formula or composition. This step is necessary before any natural substances can be made artificially, that is, synthesized. Fortunately, Szent-Györgyi lived in Szeged, the centre of the Hungarian paprika or red-pepper industry. "One night," he said, "looking at this luscious fruit, I had an idea – and my experiments the same night proved that fresh paprika [sweet red peppers] is unbelievably rich in vitamin C." He then set about the slow job of extracting pure vitamin C from fresh paprikas. The relatively large amount, about seven pounds, that this chemist obtained in two years, he divided and sent to several other chemists, one of whom was W. N. Haworth in England. Dr. Haworth was able to analyze it to find its exact formula and, by 1934, vitamin C was being synthesized on a commercial scale. It was soon given its scientific name, ascorbic acid. Today, vitamin C is quite inexpensive to produce.

In 1937, Dr. Szent-Györgyi was given a Nobel prize for his work on vitamin C. At the time, he modestly remarked: "I have become, without intention and quite by chance, the father of a vitamin; such accidents seem to happen in the world of science."

Although thousands of scientists, especially during the last fifty years, have studied vitamin C and its action in the body, they still do not know exactly how it exerts its effects. They do know that when a baby or a young guinea pig develops scurvy, connective tissue cells, which produce string-like fibres that hold or connect the different parts

of an organ together, are not properly formed. When scurvy occurs, these fibres are much weaker than is normal. As these fibres form a large part of the scar that helps to heal a wound, wounds do not heal strongly in a person who has scurvy.

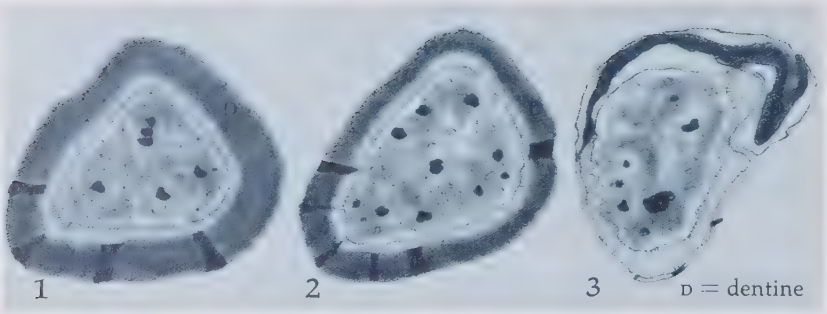
Today, scurvy is extremely rare in North American children, adolescents, and adults, but it still occurs in babies usually between six and twelve months of age. Bleeding from the gums and the appearance of blood blisters around the front teeth are two of the first signs of scurvy.



Because guinea pigs need vitamin C as do human beings, they have helped nutritionists greatly in the study of the functions of this nutrient. Certainly vitamin C helps guinea pigs grow normally, as is shown here. The guinea pig shown on the left, fed too little tomato juice, looks sick, and has lost 70 grams in weight during the eight weeks of the test. The other guinea pig, which received four times as much vitamin C, looks very healthy and has gained 143 grams. This test proves that young guinea pigs do need sufficient amounts of vitamin C to grow well. It is likely that this vitamin has a similar effect on the growth of babies, young children, and adolescents.

Possibly the cells forming the walls of tiny blood vessels are pulled apart because they are not supported sufficiently by the connective tissue fibres around them. Or, possibly, the cement-like material that holds the cells of the blood vessel wall together is weakened. The bones also become very weak, partly because the foundation tissue, similar to connective tissue, is not properly formed. In such a weakened state, the leg bone of a baby, lifted gently by the heels for a diaper change, may break. Because the blood vessels in the broken bone will bleed considerably, the baby will not move this leg because it will be so painful. As baby feedings made with pasteurized fluid milks and dried milks contain very little vitamin C, babies given such feedings must always be given vitamin drops that contain vitamin C. Another way of adding this vitamin to babies' diets is to give them suitable daily amounts of vitaminized apple juice or diluted orange juice.

Some years ago, nearly all the Canadian makers of evaporated milk began, with the approval of the Food Directorate of the Federal Health Protection Branch, to add suitable amounts of vitamin C to their product. This type of milk is often one of the ingredients in babies' formulas.



These magnified cross-sections of the incisors of guinea pigs show: (1) the thick healthy dentine of a normal guinea pig; (2) the thinner dentine which develops when less than normal amounts of vitamin C are eaten; and, (3) the thin, irregular dentine and abnormal pulp when no vitamin C has been eaten.

It is evident from tests with guinea pigs that vitamin C is also necessary for normal tooth development. Guinea pigs that are not fed enough vitamin C develop abnormalities in their incisor teeth. In guinea pigs, the sharp ends of these teeth are constantly being worn away and must be replaced by growth at the roots. There is every reason to believe that teeth, as they develop in human beings, require vitamin C as well. Human teeth grow constantly from pre-birth development until about eighteen years of age.

Vitamin C also helps the human body to absorb the iron in food.

Sources of Vitamin C

Fruits and vegetables supply nearly all vitamin C. Since some are much richer sources than others, it is useful to know which are the best to choose.

FRUITS AND JUICES HIGH IN VITAMIN C

Orange	1 medium-sized
Grapefruit	1/2 small
Tangerine	1 large
Tomatoes (field-ripened or canned)	1 large
Juices – Orange *Grapefruit* *Orange and Grapefruit* *Tangerine* *Vitaminized Apple* *Tomato*	4 ounces, fresh, frozen-diluted, canned
Strawberries or Raspberries, fresh or frozen, (if the berries are not overly soft)	1 fruit dish (1/2 cup)
Cantaloup or Muskmelon	1/2 small or 1/4 large
Spy apple in the autumn, eaten raw	1 large

Canada's Food Guide suggests "two servings of fruit or juice, including a satisfactory source of vitamin C such as oranges, tomatoes, and vitaminized apple juice," each day. Also recommended are "one serving of potatoes and two servings of other vegetables, preferably yellow or green and often raw."

Enormous daily doses of synthetic vitamin C have not been shown to improve the health of normal individuals.

VEGETABLES HIGH IN VITAMIN C IF EATEN RAW OR COOKED CAREFULLY

New potatoes
Cabbage
Turnips
Cauliflower
Brussels sprouts
Broccoli
Field-ripened tomatoes
Canned tomatoes or tomato juice

Vitamin C is rather fragile and needs to be treated carefully. Bruised and wilted fruits and vegetables have reduced amounts of vitamin C. When a green vegetable has wilted or changed in color, it is because many of the cells of which it is composed have been damaged and, as a result, the vegetable will have lost much of its vitamin C. Most vegetables and fruits such as potatoes and apples lose much of their vitamin C in a few months even though they are properly stored commercially.

PROCESSING AND ITS EFFECT UPON VITAMIN C

Eating vegetables and fruits raw supplies the maximum amount of vitamin C but, unfortunately, some vegetables and fruits have to be cooked to be edible.

In cooking with water

As vitamin C dissolves readily in water, much of it may leak out into cooking water. The following methods will help to save the most possible of this rather scarce vitamin.

Leave the skins on when possible. Potato skins, for example, may be slipped off without loss of vitamin C after the potatoes are cooked.

If the vegetable must be cut, leave the pieces moderately large as each cut surface is an escape hatch for the vitamin C to get out into the water.

Cook the vegetables in a small amount of gently boiling water just until the crisp-but-yet-tender stage. Using more water will draw out more of the vitamin C and, if overcooked, the vegetable begins to break down, allowing the vitamin to escape into the cooking water even more easily.

Use the cooking water in some way. Dilute soups or stews or make gravy.

Avoid mashing potatoes or turnips. When a hot vegetable is mashed, air is mixed into it and, as a result, much of

the vitamin C it contains is destroyed by oxidation. If the mashed vegetable is kept warm in the oven, this oxidation continues.

Do not add baking soda to keep the vegetables green. An alkali, such as soda, easily destroys vitamin C.

In canning

Although some of their vitamin C is lost, factory-canned vegetables may still retain more vitamin C than those cooked at home. Commercial canners use garden-fresh vegetables and better processing methods than many home cooks. Commercially canned fruit, except citrus products and tomatoes, also loses some of this vitamin, yet home-canned fruit usually loses even more vitamin C.

In freezing

Frozen fruits and vegetables retain more of their nutrients, vitamin C especially, than do similar products, canned. Blanching, the preliminary treatment of all raw vegetables before freezing, is necessary in order to preserve the color, flavor, and vitamin C value. In commercial freezing factories, the vegetables are blanched first by exposing them to live steam. When frozen at home, vegetables are blanched by being dipped in rapidly boiling water. This scalding, added to the later freezing, is equivalent to a partial cooking. As a result, frozen vegetables require a shorter cooking time than do fresh vegetables. A reduced cooking time produces better vegetable appearance and flavor.

Frozen fruits are best, both for nutritional value and flavor, if served just as soon as thawed or even when they still have a few crystals of ice.

VITAMIN D

Functions of Vitamin D

The human body can produce vitamin D with the help of sunlight. Only a band of the shortest of the invisible ultraviolet rays in sunlight can produce vitamin D when they fall directly on the skin. These rays change a wax-like substance that is naturally present in the skin into vitamin D. Ordinary clothing and window glass will not let these rays pass through. When the sun's ultraviolet rays hit the many tiny particles in the atmosphere, many of the rays are deflected back or scattered and these do not get through. When the sun is high in the sky, as it is in the summer, the rays have a much shorter passage through the particle-laden atmosphere than they do in the winter when the sun is lower in the sky. As a result, more of these effective ultraviolet rays reach the earth in the summer than in the winter and so summer sunshine has a much stronger vitamin D effect. These same rays also cause sunburns.

Vitamin D is valuable for the transfer of calcium from digested food to the bloodstream. The calcium helps in the building and maintaining of strong bones and teeth, and prevents rickets. For such growth, babies, children, adolescents, expectant and breast-feeding mothers need 400 units of vitamin D each day. Other adults require about 100 units.

At the turn of the century, thousands of babies, living in northern countries, developed severe bone deformities, such as knock-knees or bowlegs, because they were not given any vitamin D. These abnormalities were caused by a deficiency disease called rickets. It was especially common in crowded, smoky cities. In contrast, rickets was rare in babies who lived in the sunny, southern European countries bordering on the Mediterranean Sea.

Today, if a normally fed baby is given vitamin D, the blood will carry enough calcium and phosphorus to the bones so that they can be well-formed.

BONE DEVELOPMENT, RICKETS, AND VITAMIN D

Long before babies are born, their bones begin to form. At first, these bones are tiny models of what they will eventually be and are made entirely of a tough but pliable protein material called cartilage. This cartilage framework is later converted into bone when hard substances, mostly made of calcium and phosphorus, are deposited in it in a very orderly way. At birth, the middle part, the shaft, of each of the babies' long, narrow limb bones has already become a tube of bone. Oddly enough, nearly all the later growth in length of these long bones occurs in two transverse plates or discs which are at right angles to their length, one near each end of the bone.

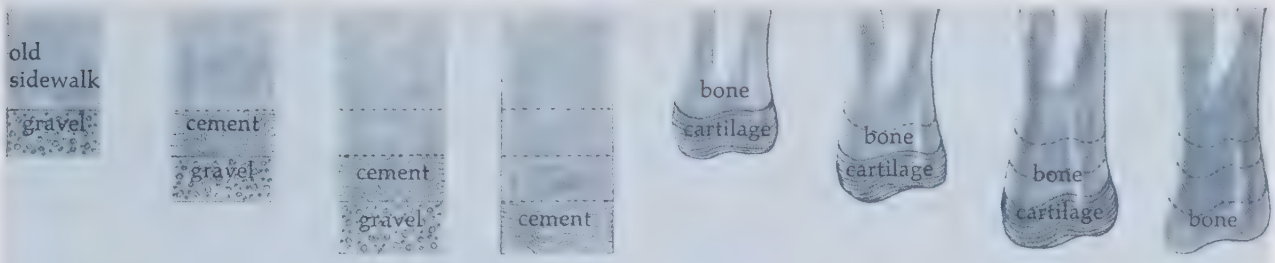
The way this growth occurs near one end of a long bone is very like the way in which two workers would extend a sidewalk. The first worker lays down a section of firm gravel; this would represent the plate of cartilage. The second pours a section of cement on top of this bed of gravel; the cement represents bone. While the second worker is busy pouring the cement, the first is preparing the next section of gravel. They carry on in this way, one following the other, until they put down the last section of cement. Naturally, gravel is much softer than cement; cartilage is also softer than bone, although the difference between these two materials is not as great as in the first example.

- *Soak a chicken leg bone – preferably, but not necessarily, uncooked, in undiluted vinegar for three days or longer. How does the bone feel when you try to bend it? Why does it feel that way? See if you can find a hole in the bone where a blood vessel entered it.*

- *Break or saw a chicken leg bone in half, preferably before it is cooked. Can you see the marrow cavity? What is the major function of the marrow cavities? The bone from a piece of round steak shows marrow even more distinctly.*

- *Buy some chicken breasts. Usually, they have been split in two by the butcher and in one of these halves can be seen both the bone and the cartilage that together form the breast bone of a young chicken. Examine the cartilage and bone and describe their appearance and texture.*

- *Buy a small chicken leg. Pull off the skin from the drumstick, separate it from the upper leg, and cut off the meat. Saw the bone lengthwise. Near the end, you will see and feel dark red, firm spongy bone. Above it you will see a white curving line. This is the growth plate, made of cartilage. Below the spongy bone is the soft pink marrow where the red blood cells and many of the white blood cells are manufactured. There is also a small patch of bone in the end or head of the leg bone.*

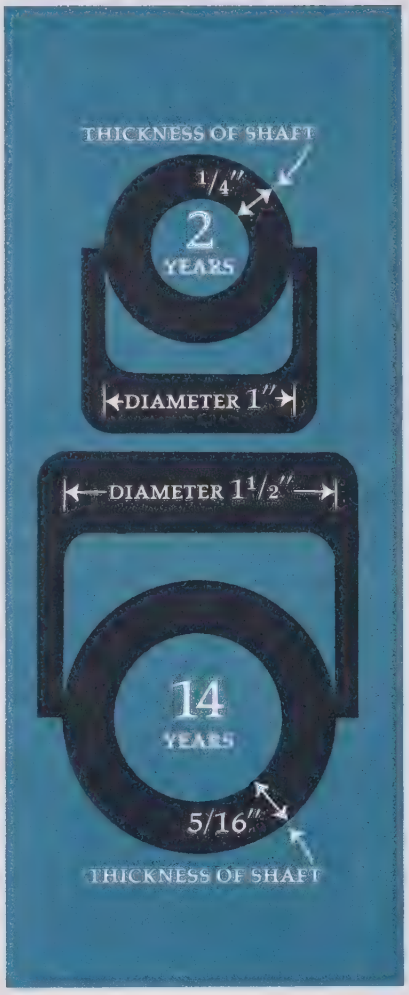


The formation of bone near the cartilage plate in the long bone is much like the way in which a sidewalk is lengthened. Gravel, the first material laid down and then covered by cement, is similar to the appearance first of cartilage, later changed into bone. Notice that, in the bone, the thickness of the cartilage remains the same during active growth.

From this description, one would think that the bone grew by fits and starts. Actually, the process is a smoothly continuous one. As the bottom layer of the cartilage plate is being converted into bone, a similarly thick new layer of cartilage is forming on the top layer. Therefore, during the time that the individual is actively growing, the plate of cartilage remains at the same degree of thickness. Shortly before he or she stops growing, new cartilage stops appearing on the upper side of the plate. However, the conversion from below of the older cartilage into bone continues until, finally, the entire plate is changed into bone. This bony plates fuses the end of the bone, the head, with the shaft. At the same time, this same series of events occurs in the plate near the lower end of the bone. Growth in length of that bone is completed when the heads are fused by bone to the shaft.

To convert cartilage into normal bone, enough of the two bone-building minerals, calcium and phosphorus, must be present in the blood supplied to the bones. With rickets, these substances are not available in sufficient amounts in the blood. Because of this, the successive layers of cartilage keep on forming as usual, but only a few irregular patches of bone are laid down in them. In consequence, this wide band of cartilage is so weak that, when a baby with rickets walks, the pressure of body weight on the lower ends of the shin bones makes them spread out and the baby develops wide ankles. Similarly, the lower ends of the forearm bones spread out when the baby puts weight on them in crawling and, the wrists thicken.

Bones also grow in width as well as in length. To do this, successive thin layers of bone form around the outside of the bone. To prevent the bones from becoming too thick and heavy, smaller amounts of bone are continuously removed from the inside. However, the shafts normally do become somewhat thicker as one grows so that they can support the heavier weight. Since rickets also prevents this normal increase in the thickness and strength of the shafts of the long bones, it is not surprising that a baby, with severe rickets, standing on weakened bones, bends them out of shape. The bones can be bent outwards to cause bowlegs or inwards to cause knock-knees. Deformities of the bones of the chest, the skull, the hip bones, and elsewhere may also occur in severe case of rickets.



The shin bone (tibia) of a healthy 14-year-old boy is much wider and somewhat thicker than that of a healthy 2-year-old boy.

At birth, babies' bones already contain considerable calcium, which, of course, they have received from their mothers. Because the milk that a breast-feeding mother produces for her baby contains calcium, she also needs extra milk and cheese and, if it is not in the milk she drinks, extra vitamin D each day when she is breast-feeding.

Children over two years of age grow much more slowly than do young babies. Probably because of this, they do not develop the bone deformities due to rickets, even if they are receiving too little vitamin D either in their food, in tablets, or from the effects of sunshine. However,

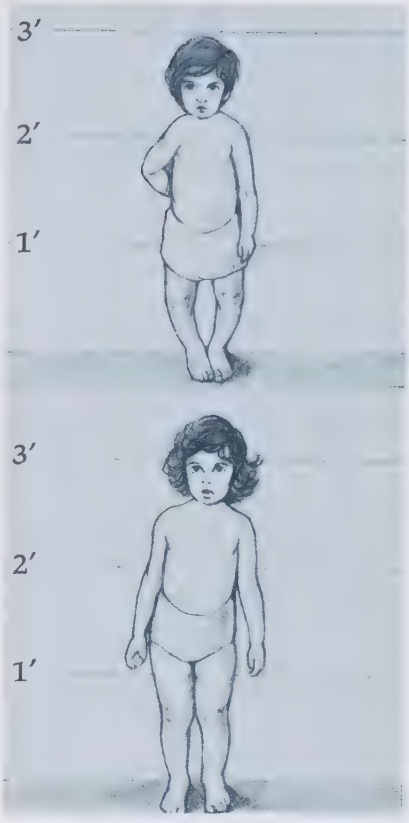
Canadian babies are still developing rickets, although practically none show marked degrees of deformity today.

very sensitive X-ray tests have shown that many young children, living in northern countries, who have not been receiving vitamin D, do develop slight degrees of rickets. Doses of vitamin D will cure this form of mild rickets. Other tests have shown that vitamin D improves the ability of most adolescents to absorb calcium, or, in other words, to get more calcium from food into the bloodstream and into bones.

Nutritionists have concluded from these tests that it is best for all persons who are still growing to take 400 I.U. of vitamin D daily, and preferably, in their food. Exceeding this amount does not increase the benefits of vitamin D.

Several teams of doctors and dentists, working with children in various parts of the world, have found that such a regular daily dose of vitamin D also reduces the number of new cavities in teeth and slows the increase in the size of the cavities already possessed. Of course, many other factors, such as well-chosen meals, little candy between meals, brushing the teeth after eating, regular care by a dentist, and the fluoridation of municipal water supplies, also help to reduce tooth decay.

It is not known if adults, other than expectant and breast-feeding mothers, need to take vitamin D. However, it would seem to be a very good habit for people who regularly work on night shift, for elderly people who only go out into the sunshine infrequently, and for people living in far northern areas who have to wear clothing that covers their skin almost completely for most of the year. In fact, during the colder months of the year, taking a small daily dose of at least 100 I.U. of vitamin D is probably a wise precaution for all adults living in northern countries. Fortunately, many people can now easily obtain this much or more from milk and margarine if these products have been enriched with vitamin D.



In the girl, aged 2 years, 9 months, at the top, the badly bowed legs are due to rickets. Below is the same girl, aged 3 years, 9 months, after daily doses of vitamin D and the use of splints at night.

Sources of Vitamin D

Very few foods contain appreciable amounts of vitamin D. By far the richest sources of it are certain salt-water fish such as salmon, sardines, tuna, herring, pilchards, and mackerel. An ordinary serving of any one of these in fresh, frozen, or canned form will supply about 300 I.U. of vitamin D. Traces of vitamin D are found in liver, in eggs laid by hens that have received fish oil in their feed and, in summer, in butter.

For some years, vitamin D has been added to many pasteurized milks. Evaporated milks have been similarly fortified with vitamin D. Many dried skim milk powders have now had enough vitamin D added to them so that when they are mixed with water they are as rich in this vitamin as are the vitamin D-fortified pasteurized milks. As vitamin D helps the body to make use of milk's most outstanding nutrient, calcium, it is a good food to so enrich. Vitamin D is not added to chocolate dairy drink or buttermilk. By reading the labels, one will find that a number of brands of margarine are also fortified with vitamin D. They usually contain either 1720 I.U. or 2270 I.U. per pound.

With very few exceptions, all infant formula foods contain enough of this vitamin so that most babies fed them will receive 300 to 400 I.U. of vitamin D each day. If vitamin D-fortified milk is not available, simple vitamin tablets or capsules, each of which contains 400 I.U. of this vitamin, are a valid alternate. Most of them also provide good amounts of

✦ Canada's Food Guide *advises 400 I.U. of vitamin D each day for expectant and breast-feeding mothers.*

✦ *The Health Protection Branch of the Department of National Health in Ottawa now allows Canadian dairies to add between 300 and 400 I.U. of vitamin D to each 30 ounces of pasteurized fluid milk. Many dairies do so and the label on a carton of such milk states that it contains 35.2 I.U. per 100 ml. As 100 millilitres is almost exactly 3½ ounces, dairies have added 10 I.U. per ounce of milk.*

vitamin A and many contain some vitamin C as well. One of these each day during the colder months of the year is advisable. The multi-vitamin preparations that include several of the B vitamins as well are more expensive and unnecessary since an ordinary, well-chosen diet supplies enough of the B vitamins.

Fortunately, cooking does not harm vitamin D.

OTHER VITAMINS

Vitamin E is another of the fat-soluble vitamins. The best sources of vitamin E are the vegetable oils and the margarines and mayonnaises that contain such oils. Smaller amounts of this vitamin are found in practically any of the common foods. Very rarely, a premature baby is born with too small a reserve of vitamin E in its body. The anaemia that the baby may develop is treated with doses of this vitamin.

Vitamin K is also a fat-soluble vitamin. Dark green leafy vegetables and liver supply good amounts of this vitamin, but the millions of harmless bacteria that normally live in the lower part of the digestive tract also can produce vitamin K in abundance.

Disease caused by a lack of vitamin E has never been shown to occur in other Canadians.

Vitamin A

1. Recent work in Canada has shown that the liver stores of vitamin A in individuals 10 to 20 years of age are far lower than in those under 10 years of age. Such low stores are certainly not desirable, and it is recommended that adolescents, especially, eat at least 2700 to 3200 I.U. of vitamin A daily.

   To find out approximately how much vitamin A value you are getting in your meals and snacks each day, keep a record of the amounts of everything you eat, both in and between meals, for four days. Use household measures such as cups and teaspoons in recording the amounts. Using food tables, add up the total vitamin A value for the four days. Divide the total by four to determine the amount per day. How did you do? Doing this test just once for the four-day period will show you which foods are rich in vitamin A and will also suggest to you how you can eat more of this vitamin.

Thiamin

1. Answer true or false and give reasons for your answer.
   a) The label reveals whether or not a cereal has been fortified.
   b) An unfortified puffed cereal contains no thiamin.
   c) None of the thiamin in vegetables or in ham leaks out in the water in which they are cooked.
   d) Enriched white flour does not contain as much thiamin as 100-percent whole wheat flour.
   e) High heat destroys more of the thiamin in roast pork than does moderate heat.
   f) It is a good habit to add some baking soda to the water in which a green vegetable is cooked.
2. Read the labels of the spaghetti and macaroni products in your home or at the store. Are any labelled "vitamins added?"
3. Read the labels on the ready-to-eat cereals in your home. If they are fortified, the amount of thiamin will be stated as so many milligrams per ounce or per 100 grams.

   One ounce of most of these cereals is the usual serving. Calculate how much thiamin you are getting per serving by dividing the amount in 100 grams by 2/7.
4. Read the labels on two common brands of bran flakes. Is there any difference in the way in which they have been fortified? Do all the fortified cereals made by these two manufacturers differ in this way?
5. See if you can find a ready-to-eat cereal that has been fortified with two of the main B vitamins, but not thiamin.

6. Study the part of the label that describes the amounts of the B vitamins and iron that are found in a bag of enriched flour. Look up wheat flour in food tables to compare its nutrient values with both enriched and unenriched flour. Why is enrichment valuable? Do you think it should be compulsory?

Riboflavin

1. Answer true or false and give reasons for your answer.
   a) Milk is the main source of riboflavin.
   b) Riboflavin is easily damaged by heat.
   c) Overly long cooking of cut-up vegetables in a large amount of water leads to large losses of riboflavin.
   d) Meals containing very little riboflavin can have an unpleasant effect on your complexion.
   e) Milk is a fattening food.
2. The amount of riboflavin added to enrich white flour in Canada exceeds that found naturally in whole wheat flour. Check with food tables to see this difference. What is the reason for this fortification?
3. Surveys have shown that a large percentage of teenagers, especially girls, do not eat or drink the recommended amount of milk. What reasons could explain this?
4. During the making of most cheese, much of the watery whey is drained off. Why would this lead to a loss of riboflavin?

Vitamin C

1. Answer true or false and give reasons for your answer.
   a) You should take a daily serving of a food rich in vitamin C that has not been cooked or dried.
   b) Freezing is a poor way to preserve the vitamin C in concentrated orange juice.
   c) Vitaminized apple juice can take the place of citrus juice.
   d) Four ounces of citrus juice is a reasonable daily serving.
   e) Turnips, cabbage, cauliflower, Brussels sprouts, and broccoli all belong to the cabbage family.
   f) Vitamin C is the one vitamin most easily lost in cooking.
2. Describe in your own words the action of vitamin C in human beings.
3. How should you choose, store, and cook vegetables in order to retain as much as possible of their vitamin C content? Explain why the methods you suggest help to save this vitamin.
4. At this time of the year, what is the most economical way to buy a good daily supply of vitamin C? Make a table showing how the the prices of the various alternatives compare.

Vitamin D

1. What is the main action of vitamin D in the body?
2. How much vitamin D do you need per day and how can you obtain it?

3. Why does rickets occur only in babies?
4. Explain why summer sunshine produces far more vitamin D when it falls on your skin than does winter sunshine.

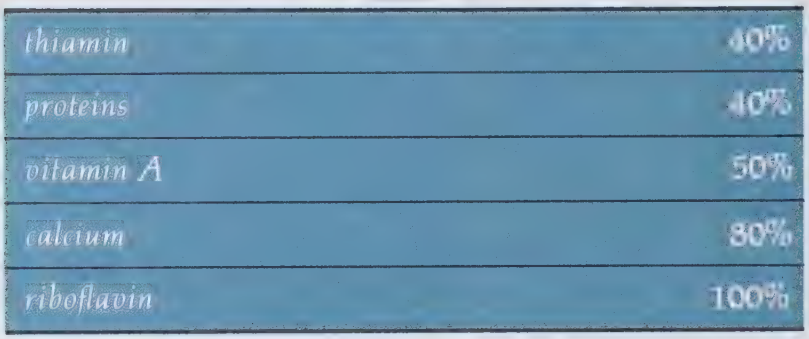
The Five Key Vitamins

1. Answer true or false and give reasons for your answer.
   a) You can eat anything you want if you have a vitamin pill daily.
   b) Enriched white bread is a poor substitute for whole wheat bread.
   c) Yellow and green vegetables have high vitamin A value.
   d) Vitamin D is of no value to you when you are growing.
   e) Frozen citrus juice can take the place of fresh citrus fruits.
   f) Milk is a poor source of riboflavin.
2. Give some reasons why it is much better to obtain your vitamins in your foods, many of which are packaged by nature, rather than in vitamin pills.
3. How can a nutritionist demonstrate that a young rat needs to eat one of the key vitamins? Why are rats suitable animals for such tests? What is meant by a control group?
4. Name one common, relatively popular food that is an excellent source of each of the five key vitamins: vitamin A, thiamin, riboflavin, vitamin C, and vitamin D. How much of each would you recommend each day?
5. Choose one of the key vitamins and give either a talk to your class or write a short essay on its main functions in the body, the disease or symptoms that a complete lack of it causes, and the common foods that provide it in generous amounts. You might also include something about the history of the disease. Why are acute deficiency diseases rare in most parts of Canada now?
6. Growing individuals show the effects of inadequate food the most quickly. Such persons are often called nutritionally vulnerable. Why are they vulnerable? List at least four stages of human life in which growth occurs.
7. Stress increases the need for many nutrients. Besides the stress of rapid growth, to what other stresses are we exposed at least at intervals? Why would a person with good eating habits be better able to withstand such stresses than one who is less well-nourished?

Section 2

Foods

1 Milk



Four cups of whole milk supply the above percentages of the recommended daily quotas of five important nutrients.

● *"Commercial dairy herds supply the local population [of Canada] with milk, with the exception of Newfoundland, the Yukon, and the Northwest Territories. The largest concentration is in Ontario and Quebec where 73% of the total milk production of approximately 18 billion pounds is produced. Dairy product production in Canada exceeds domestic utilization."*

NUTRIENT CONTENT OF MILK

Compared with other foods, any kind of milk is a remarkably rich source of both calcium and riboflavin. The suggested amount fills 40 percent of the daily quotas of both thiamin and proteins. Skim milk is practically fat free and, therefore, lacks vitamin A. Some brands, however, are now fortified with this vitamin. Vitamin A is found exclusively in the fat or cream of milk. Therefore, whole milk with about half the vitamin A advised daily for adolescents, has nearly twice as much vitamin A value as two-percent milk.

Milk is always low in iron. As raw milk, it is also low in vitamin D and vitamin C. Fortunately, vitamin D is now added to many different kinds of milk and most brands of evaporated milk are also fortified with vitamin C.

In its liquid form, milk is 87 to 90 percent water, and is therefore relatively low in calories.

🍁 Canada's Food Guide *recommends four cups of milk a day for adolescents. It does not specify what kind of milk nor how it should be taken. One can substitute any milk-containing product for some of the recommended amount.*

Calcium in Milk

Calcium is essential for building bones and teeth during the major growth period, but it is very useful for some five years after growth stops because during that time extra supplies of calcium can still be laid down in the bones. In this way, the bones become even stronger and an extra store of calcium for future use is built up.

● *"Shortage of calcium and vitamin D in the diets of many infants, children and adolescents is another problem documented by Nutrition Canada. Adequacy of calcium at this stage is essential to building a healthy skeleton and maintaining it throughout adult years. . . . Since the . . . [study] assumed that all milk was fortified, and since milk is the major dietary source of vitamin D, the shortage in dietary vitamin D indicates a low consumption of milk among children and adolescents."*

Baby bones are forming long before birth. Until birth, babies receive all their food supplies from their mothers. Thus, during the last half of a pregnancy, mothers should have four cups of milk daily to meet both the needs of their rapidly growing babies and of their own bodies. Often, doctors suggest skim milk because it is lower in calories. If a mother breast-feeds her baby, generous amounts of milk will help her to produce plenty of breast milk which, of course, provides calcium for the baby. All other adults are advised to take at least one and a half cups of milk in some form each day to replace the calcium lost each day from the body.

Since some adults never drink milk and some seldom eat cheese, they may be taking in less calcium than they are losing from their bones. If these habits persist for many years, the bones may eventually be weakened. In minor accidents, such people are likely to break bones. Often, they suffer from a type of back pain which is also due to bone weakness.

CALCIUM IN A SINGLE-DAY MENU

The following single-day menu, which contains no milk, cream or cheese, provides only 300 milligrams of calcium. The suggested four cups could be added as milk with cereal, milk or cocoa with each meal and, as ice cream or milk pudding in dessert.
If four cups of milk are included in this menu, 1000 more milligrams of calcium will be added.

BREAKFAST	LUNCH	DINNER
4 ounces orange juice	*2 hot dogs and 2 buns*	*4 ounces of roast beef*
1 egg	*1 banana*	*1/2 cup of peas*
2 slices side bacon	*1 soft drink*	*1 potato*
1 roll with butter and jam		*1 dish canned peaches*
		2 oatmeal cookies
1 cup black coffee		*1 cup clear tea*

Vitamin D in Milk

Four cups of vitamin D-fortified milk provide 320 I.U. of vitamin D.

One of the major effects of vitamin D is to improve the absorption of calcium. Since most calcium compounds do not dissolve readily in water, they are rather hard to absorb from the digested food into the blood vessels.

Riboflavin in Milk

Milk is also the chief source of riboflavin. In fact, two and one-half cups contain as much riboflavin as any complete day's meals that did not include liver, heart, or kidney. For all but very energetic, older, male

adolescents, four cups of milk will completely meet the daily quota of riboflavin.

This B vitamin helps body cells to obtain energy from several of the simple substances derived from food that the blood has brought to them.

Proteins in Milk

Milk is a source of complete proteins. Four cups of it have nearly as much protein as two ordinary servings of meat or fish, or 40 percent of the daily allotment of protein. The essential amino acids in the milk proteins can even compensate for the deficiencies of the incomplete proteins present in grains and other plant foods. For this reason, bread and cheese or cereal and milk are good combinations.

Measure half a cup of milk into a large clear glass. Add three teaspoons of white or preferably malt vinegar. Swirl the glass gently so that the milk rises up the wall of the glass. What do you see on the glass? Pour the milk and vinegar into a saucepan and heat at moderate temperature. What appears in the milk? What do you think has occurred? Record your observations.

Vitamin A in Milk

All the vitamin A value of milk is found in its fat, which is usually called its cream. Most of it is in the form of vitamin A itself but there is some carotene as well. As both forms of this nutrient dissolve in fat, but not in water, it is not surprising that they are found only in the milk fat. Raw milk, about $3^1/_2$ percent fat, is often called whole milk or full fat milk. Whether homogenized or not, four cups of whole milk contain about half the vitamin A daily quota.

In HOMOGENIZATION, milk is forced through very small openings under considerable pressure. This breaks the fat into such tiny droplets that they stay suspended in the milk, instead of rising to form a top layer of cream.

Two-percent milk contains 2 percent milk fat. Because a little less than half of its fat has been removed, four cups, daily, of 2-percent milk has about half the vitamin A value of whole milk, and only one-quarter of the daily vitamin A quota.

As practically all of the fat is removed from skim milk, it contains almost no vitamin A. While this does not mean that 2-percent milk or skim milk are unsuitable foods, it does mean one's daily menu, in compensation, must include more of the other high vitamin A-value foods such as dark yellow-fleshed fruits and vegetables, green vegetables, margarine, butter, whole milk cheese, eggs, and liver, especially. Several brands of dried skim milk have been fortified with suitable amounts of both vitamin A and vitamin D.

Thiamin in Milk

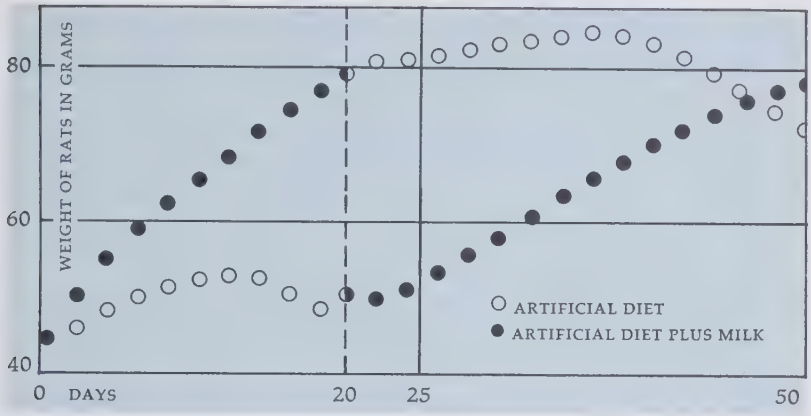
Four cups of milk a day also provide about 40 percent of the daily quota of thiamin. All body cells need good supplies of thiamin to carry out essential, energy-yielding activities.

Other Nutrients in Milk

Milk is 87 to 90 percent water, depending on whether the fat is removed or retained. All young mammals, such as babies, need generous supplies of water in their early days and milk fills this need easily.

About 5 percent of milk is milk sugar, technically called lactose. Lactose is another type of double sugar, although it is not as sweet as common white sugar. Milk is the only food of animal origin that contains more than a trace of sugar.

Milk also contains valuable amounts of many of the other B vitamins, such as niacin, vitamin B_6, vitamin B_{12}, and folacin, and of many other minerals besides calcium.



This graph charts the growth of two groups of very similar young rats. One group (colored circle) was fed an artificial diet consisting of pure carbohydrates, fats, proteins, minerals, and water (but lacking vitamins); the other (black circle) was fed the same artificial diet but with 1/2 teaspoon of homogenized milk added for each rat. After the first 20 days, the diets were switched.

CALORIES IN MILK

Some people stop using milk because they think it is fattening. It is true that eating too much of any kind of food is fattening; yet, milk does not deserve any special singling out on its own. The total daily amount of food that one needs varies mostly with the amount of physical work and muscular activity that one does; it also varies to some extent with one's rate of growth and one's height.

The calorie values of the various kinds of milk differ greatly according to the percentage of fat in them — one ounce of a pure fat has two and one-quarter times as many calories as one ounce of a pure carbohydrate such as sugar. Except for the fat and vitamin A which is reduced in 2-percent milk and completely non-existent in unfortified skim milk, all the other milk nutrients are the same in whole milk, 2-percent milk, and skim milk.

For people who are concerned about weight gain, skim milk is a good substitute for whole milk. People who have developed the habit of drinking skim milk may even prefer it to whole milk. Dried skim milk, often called non-fat milk solids, is just as nutritious as the fluid pasteurized type.

CALORIES PER 8 OZ GLASS	
skim milk	80
2% milk	120
whole milk	160
chocolate dairy drink	190

The flavor of skim milk may be improved by making it up the night before, using a little more of the powder than is called for, and then refrigerating it. After overnight storage, skim milk actually tastes sweeter because the milk sugar – lactose, dissolves slowly and it needs time to spread through the fluid.

◗ *Buy two regular-sized packages, 4 ounces each, of instant chocolate pudding mix. Make one as directed with 2 cups of reconstituted dried skim milk. Make the other by mixing in 2/3 cup of dry milk powder and then adding 2 cups of water. Refrigerate both for two hours and then taste them. Record any differences in flavor and consistency. If possible, refrigerate them overnight, and compare them again.*

Physicians, nutritionists, and home economics teachers are the only persons qualified to prescribe suitable reducing diets. Such diets for adults usually include at least two glasses of skim milk, not only because it is such a valuable low-calorie food, but because it stays in the stomach for about three hours. This delay in the stomach is due to the coagulation of the milk proteins by the normally acid stomach juice; milk does not pass out of the stomach quickly, as does water. As a result, the dieter is less tempted to snack between meals. For good reason, then, the main ingredient in both the canned, complete reducing foods and in the instant breakfasts is either concentrated skim milk or dried skim milk.

PASTEURIZATION OF MILK

Milk is commonly pasteurized by heating it to 161° Fahrenheit for only 15 seconds. This, although quite a gentle way to treat the milk, is sufficient to kill any disease-producing germs. It is incorrect to claim that pasteurization appreciably reduces the food value of milk. A little of the vitamin C is destroyed but since even raw milk is very low in this nutrient, this loss is of no consequence.

Pasteurization is not used to make dirty milk saleable. Pasteurized milk is the only type of unconcentrated milk to buy. Raw milk collected from dairy farmers is tested for cleanliness and the farms themselves are inspected by field men from the dairies or by government inspectors. If the dairy farmers produce milk that does not meet these tests, they are warned. If they do not improve their methods, they lose their contracts with the dairy.

Before pasteurization of milk became common, many children spent months in hospital suffering from milk-borne tuberculosis of the glands, the intestines, or of the bones. Sometimes, this bone disease left them permanently crippled. Occasionally, young children were killed by the tuberculosis germs they had drunk in raw milk. Other people developed undulant fever, a prolonged and exhausting disease, because they had used unpasteurized milk from cows or goats infected with undulant fever germs. Although it is common practice now to immunize female calves against this disease, pasteurization is still necessary.

All the fluid milk sold by dairies in Ontario and Saskatchewan must, by law, be pasteurized. Although the other parts of Canada do not have provincial laws demanding this safeguard, most cities and many large towns do have municipal regulations that prohibit the sale of unpasteurized milk within their borders.

TYPES OF MILK AND MILK DRINKS

Two-percent Milk and Skim Milk

When manufacturers add vitamin A to 2-percent milk and skim milk, this fortification offsets the loss of the vitamin A that the skimmed-off fat contains.

Recently, the Food Directorate of the Department of National Health passed a regulation allowing dairies to add 1600 and 2500 I.U. of vitamin A to 30 ounces of 2-percent milk and skim milk, respectively. This type of fortification, carried out in southern British Columbia and Alberta for years, more than replaces the vitamin A removed when part or all of the fat is skimmed from whole milk.

Jersey Milk

Containing 4 to 5 percent fat, this kind of milk is higher in calories than whole milk. Jersey milk is available, occassionally, at a premum price.

Chocolate Dairy Drink

Chocolate dairy drink is a mixture of 2-percent milk, chocolate syrup, and a stabilizer, often made from seaweed, which keeps the chocolate evenly suspended. Due to the sugar and fat in the chocolate syrup, this drink is a little higher in calories than whole milk, with about 190 calories per eight-ounce glass. Chocolate dairy milk is also more expensive than whole milk due to the special processing and the extra materials required. Unfortunately, at present, few if any brands of chocolate dairy drink are fortified with vitamin D.

Some small children object to drinking 'white' milk. Economy-minded parents can easily add a small amount of chocolate syrup to 'white' milk as coloring.

Buttermilk

Natural buttermilk, a by-product of butter-making, is the equivalent of skim milk in calories; natural buttermilk is very rarely available.

Practically all of the buttermilk available is 'cultured' milk and most of it is made of 2-percent milk. To produce it, the dairy adds to the milk a suitable number – a culture, of one particular type of harmless bacteria. These bacteria then increase in number and change the natural sugar lactose in the milk into lactic acid. Lactic acid causes the milk to thicken or curdle and gives it a sharp taste. This processing makes buttermilk more expensive than ordinary 2-percent or whole milk.

Buttermilk is no more beneficial to health than the common types of milk but some people do prefer its taste. Its calorie count, like the other 2-percent milks, is 120 calories per eight-ounce glass. It, too, is not fortified with vitamin D.

Dried Milks

Dried whole milk costs about as much as pasteurized whole milk; it is not commonly available. Dried skim milk, however, is both inexpensive, readily obtainable, and is processed in such a way that its food value is not damaged. To add even more food value, some manufacturers are now adding enough vitamin A and vitamin D to dried skim milk so that eight ounces of it contain some 500 I.U. of vitamin A and 100 I.U. of vitamin D. This exceeds the vitamin A and vitamin D value in the same amount of whole milk enriched with vitamin D.

Dried skim milk is by far the most inexpensive source of complete proteins, costing less than one half as much as fluid skim milk. Dry skim milk powder keeps well for weeks or even months after the package or bag is opened.

Obtain a clean bottle that holds four to six ounces of water. Put a drop of skim milk into the bottle. Fill the bottle about two-thirds full with water. Close the lid tightly and shake the bottle vigorously for a minute or so. Let it stand for half a minute. What do you see around the upper edge of the water? Repeat the test, using a few drops of vinegar instead of milk. Then try half a teaspoon of sugar. Do you notice any bubbles? Record your observations. Frothing indicates the presence of even a very small amount of protein. A few other substances that do not contain protein, soap for example, also cause frothing.

Evaporated Milks

Milks are evaporated by being heated under a vacuum until a little more than half their water is driven off. The use of a vacuum causes milk to boil at a relatively low temperature, which reduces the loss of thiamin

due to heat. The milks are then poured into cans, sealed, and sterilized. As a result, unopened cans do not need to be refrigerated.

In isolated northern areas, where fluid milk is not available, and where refrigeration facilities are meagre or missing, evaporated milk is very practical. Its added vitamins are especially valuable, for, in northern areas, the sun is low in the sky for many months of the year and, therefore, has little vitamin D effect. Also, in these areas, foods high in vitamin C are scarce and more expensive.

The commonest type of evaporated milk is made of whole milk. One 15-ounce can of evaporated whole milk plus one can of water is equivalent to about 30 ounces of whole milk. One brand of evaporated whole milk states on its label that, in its concentrated form, it contains 8 percent fat. Since pasteurized whole milk is about $3^1/_2$ percent fat, the degree of concentration of the evaporated milk is a little more than twice as much.

Due to its processing, evaporated milk has a rather distinctive flavor. When it is used for making spiced or flavored dishes, its unusual taste may be concealed.

All Canadian evaporated milks are now fortified with vitamin D. In addition, most brands of evaporated milk sold in Canada are now fortified with 4 milligrams per ounce of vitamin C to help prevent scurvy in babies. Just 10 milligrams of vitamin C each day will save a baby from developing scurvy, even though 20 milligrams is the amount recommended.

Condensed Milks

Condensed milk resembles evaporated milk that has been heavily sweetened with sugar. Undiluted evaporated milk contains about 10 percent sugar, condensed milk, about 55 percent. The greater sweetness of the condensed milk makes it higher in calories. Because of this high sugar content, condensed milk is not a suitable ingredient in babies' feedings. It is, however, a required item in some recipes for candy and cookies.

STORING MILK AT HOME

As germs thrive in milk, it should be refrigerated. The cold temperature reduces the rate of multiplication of the souring bacteria.

If using bottled milk, one should wash and dry the lid before refrigerating the milk.

Milk is best covered to prevent it from absorbing undesirable flavors.

Unopened cans of milk will keep safely for years, as a story from the gold rush days show. A few cans that had been used to prop up a shelf in a deserted store in the Klondike were discovered some fifty years after the gold rush of 1898. The milk in them was still useable although it was curdled, probably due to its many freezings and thawings.

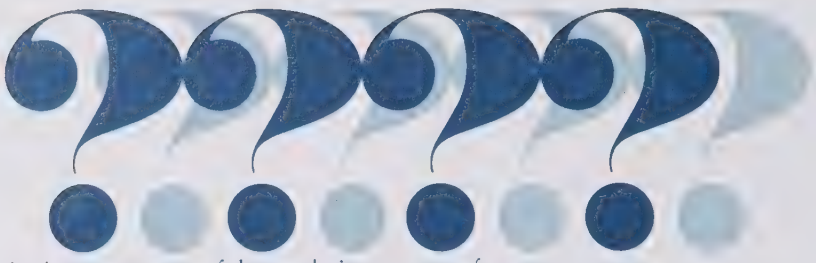
COOKING WITH MILK

When milk is heated, a film, mostly made of coagulated milk proteins, forms on its surface. Further heating will cause pressure to build up under the film, which finally breaks and allows the milk to erupt over the sides of the pan. Heating milk slowly in a covered pan reduces or may even prevent the

formation of this film. Stirring or beating the milk during the heating also prevents this problem. The bubbles produced by the beating reduce the drying effect of the air and so discourage development of the surface film.

When milk is heated, some of its proteins change structure and coagulate on the bottom and sides of the pan. Some of the milk sugar mixes in with this protein. These deposits, especially on the bottom of a pan, are likely to scorch unless the heat is kept low. Heating the milk over water will prevent scorching as will very slow heating.

When an acid food or one containing substances called tannins is added to milk, some of the milk proteins coagulate in white clumps or curds. Milk that is beginning to sour is more apt to curdle than is fresher milk. Meat, fish, vegetables, and fruits can all have this curdling effect. In making home-made cream of tomato soup, for example, a way to prevent this curdling is to stir the tomato slowly into the white sauce. Using a moderate oven will reduce the curdling of scalloped potatoes, as will thickening the sauce that is added to them before cooking.



1. Answer true or false and give reasons for your answer.
   a) Dry skim milk with vitamins A and D added has the same nutritive value as fluid skim milk enriched with vitamin D.
   b) Pasteurization destroys the vitamins in milk.
   c) Milk increases the production of mucus.
   d) Milk is a food for babies only.
   e) Milk is the best food to fortify with vitamin D.
   f) Skim milk is a low-calorie food as it has only half the calories per ounce of whole milk.
   g) Cooking does not alter the food value of milk to any extent.
2. From 2700 to 3200 I.U. of vitamin A per day is advised for adolescents. See if you can find any 2-percent or skim milk that has been fortified with vitamin A.
3. What are some of the fairly recent developments that have helped to keep the cost of milk down? Why have they had this effect and how can you co-operate with the retailer?
4. Compare the cost of reconstituted dried skim milk with pasteurized fluid skim milk. What advantages are there in using dried skim milk?
5. Three types of fluid milk or milk drink contain 2 percent milk fat. What are they? How do they compare in price and in calories? How can you make a relatively cheap type of 2-percent milk?
6. Why, in containers of the same size, is pasteurized whole milk the most expensive, 2-percent the next most expensive, and skim milk the least expensive.
7. Read about how dried skim milk is made. Was it always made this way? Give a talk to your class on this topic or, if possible, visit a plant where it is made.
8. Using food tables, find out the number of calories per eight-ounce glass of whole milk, 2-percent milk, skim milk, coke, ginger ale, a cup of tea of coffee with 1 teaspoon of sugar and 1 ounce of 18-percent table cream added, and a mug of cocoa made with whole milk, 1 teaspoon of cocoa, and 1 tablespoon of sugar.
9. What are some new ways of adding more milk to your daily meals and snacks?
10. What two good effects does the milk in recipes for bread, rolls, and muffins have?

2 Milk Products

CHEESE

Cheese and some of the other milk products can be almost as nutritious foods as milk. Cheese, especially, can be served at any time, adding variety and protein to meals. As a breakfast food, cheese is very popular in Holland and the Scandinavian countries. Sandwiches made of sliced process cheese travel well and are a good lunch choice. Cheese and crackers, with perhaps some fruit as well, can be served as a dessert. Cheese is also a favorite snack and party food.

Varieties of Cheese

Most of the cheese produced in Europe and in North America is made from cow's milk, but, in some European countries, the milk of goats and sheep is also used. In Eastern countries, cheese is made from the milk of sheep, goats, camels, or water buffalo, and in Lapland it is made from the milk of reindeer.

The two major types of cheese are the ripened, or cured, and the unripened. The ripened cheeses are cured or aged to produce their distinctive flavors and textures; most are compressed to reduce their water content. The unripened cheeses are not aged at all and contain a higher percentage of water. They are lower in food value than are the other more concentrated types. A typical example of a ripened cheese is cheddar; common types of unripened cheeses are cottage cheese and cream cheese.

CHEDDAR CHEESE

To make cheddar cheese, fresh whole cow's milk is brought from dairy farms to cheese factories where it is tested for purity, sweetness, and butterfat content. The milk is then warmed in large vats and mixed with a small amount of a 'starter' culture of lactic acid bacteria, harmless organisms that cause milk to sour. The culture is called a 'starter' because it slightly acidifies the milk and starts the coagulation of the milk proteins. If the cheese is to be colored, pure vegetable coloring is added after the starter culture. Next, rennet is stirred into the warm milk which is then left undisturbed to set in a soft curd. Later, the curd is cut into cubes and blocks so that the whey, a watery fluid, will drain

Cheese-making is quite a complicated art. How was it ever discovered? One theory is that, many hundreds of years ago, an Arabian traveller came upon the secret by accident. Before setting out on his camel, he put his day's supply of milk into a pouch made of a calf's stomach, this, he slung over his saddle. By evening, an enzyme–rennet, naturally present in the pouch, the warmth of the sun, and the jogging of the camel had converted the milk into cheese–curds, and watery whey.

Whether this story is true will probably never be known, but it is known that, in the Middle Ages, the monks in Europe kept this art alive and taught it to the neighboring farm families. Then, and in fact until about a hundred years ago, cows only produced milk in the spring and summer. The owners of the cows did not have enough fodder and turnips to feed them properly through the winter and most of the cows went 'dry.' To save as much as possible of the abundant summer supply of milk, the farmers converted much of it into cheese. In the days of Queen Elizabeth I, the country people in England usually ate cheese three times a day and it was called the poor man's 'white meat.'

Canada is famous for its cheddar cheese, which is exported to many countries, including England, where Cheddar was first made. Oka and Ermite are also distinctively Canadian cheeses.

Canada produces about one hundred and ninety million pounds of cheddar cheese each year.

off more easily. This process is known as CHEDDARING. Finally, the curd is salted and pressed into forms lined with cheesecloth. The cheeses are dated and placed in the curing room where the temperature and humidity are carefully controlled. During curing, the flavor and texture of the cheese are developed and the rind forms on the outside.

Mild cheddar is cured for only sixty days and it is smooth and mild-flavored. Cheddar cured for a year or longer has a nippy flavor and a crumbly texture and is sold as 'old' cheese. Medium cheddar has been cured for longer than sixty days but not for as long as the old cheddar. Since old cheese takes the longest time to produce, it is more expensive than mild or medium cheese.

Cheddar cheese that has not been colored is creamy white; if color has been added, the cheese will be a medium yellow or a deep orange. The color does not affect the flavor or food value of the cheese in any way.

Although cheddar cheese is not sold by grade in retail stores, practically all of it is graded in the warehouse.

In Canada, cheddar cheese must either be made from pasteurized milk or it must be cured for at least sixty days before it is put on the retail market. After such a period of curing, the cheese is entirely safe, even if the milk used has not been pasteurized. Actually, the cheese may be left in the curing room for two years or more.

Most cheddar cheese sold in Canada is 'Canada First Grade.'

PROCESS CHEESES

Processed cheeses are as nutritious as unprocessed cheeses; pasteurized cheeses are equal in food value to those rendered safe by aging.

Process cheese is popular because it keeps well, is chewed easily, slices easily, spreads readily, and melts well to blend with other foods. Process cheese has not quite as much value as cheddar due to a slightly higher water content, but the difference is small.

Process cheese is sold in many forms – in blocks, in slices, and in individual portions. Each extra step in manufacturing and packaging adds to the cost. Sliced process cheese is a little more expensive than unsliced process cheese of the same brand.

Whole Milk Process Cheeses – To make process cheese, the manufacturer chops up the required amount of one or more varieties of cheese, most commonly cheddar, adds a small amount of a harmless emulsifier, and melts the cheese. The emulsifier keeps the cheese soft and smooth by spreading the fat evenly throughout; the heat pasteurizes the cheese. Although some people have claimed that the emulsifiers are harmful, it has been proved that they are all quite harmless. In fact, all but one of them occur naturally in other foods.

Skim Milk Process Cheeses – Skim milk process cheeses contain about one quarter as much fat as the usual whole milk process cheeses or spreads. Because some dried skim milk has been added to them, they are much lower in calories and vitamin A than whole milk cheeses, but are considerably higher in calcium. The firmer types have not as much flavor as the usual whole milk process cheeses, but can serve as spreads that have only one quarter the calories of margarine or butter.

CHEESE SPREADS

Cheese spreads are similar to process cheeses that have been diluted with milk or whey so that they spread more easily. Because of this dilution, they are not quite as high in food value as the process cheeses.

FANCY CHEESES

Fancy cheeses are made in much the same way as are cheddars. However, special types of souring and other harmless bacteria are used in their production. For some fancy cheeses, bacteria are used to produce holes. Others, such as the blue or Roquefort cheeses, are inoculated with harmless moulds that are blue-green in color. These moulds are relatives of the one from which penicillin was originally obtained.

Some of these fancy cheeses are very mild; some have very decided flavors and aromas.

Nutrient Content of Cheese

One ounce of cheddar or process cheese has about as much calcium and protein as seven ounces of milk, but less riboflavin.

It requires approximately eleven pounds, or a little over a gallon of whole milk, to make one pound of cheddar cheese, for example. Fortunately, nearly two-thirds of the calcium and protein and about 85 percent of the fat and vitamin A from the whole milk is concentrated in the cheese.

RIBOFLAVIN IN CHEESE

As riboflavin dissolves in water, about two-thirds of it escapes into the whey. Yet, even with this amount lost, cheese is still a good source of riboflavin. Only an eight-ounce glass of milk or a four-ounce serving of lean meat, especially liver, has more riboflavin in it than a one-ounce serving of a firm cheese.

CALCIUM IN CHEESE

No other food is as well supplied with calcium as the relatively firm cheeses. One ounce of cheddar or process cheese has about 200 mg of calcium, one-sixth of the daily quota. The cheese spreads have about half as much, which is, nevertheless, a good amount. Partly because they are so moist, cottage cheese and cream cheese are much lower in calcium.

PROTEINS IN CHEESE

Both cheddar and process cheeses are remarkably concentrated sources of complete proteins. Nearly 25 percent of each is protein so that a one-ounce serving of either has one-tenth the daily quota. Many kinds of meat, even after they have been cooked, do not contain such a high percentage of protein.

Cottage cheese is relatively richer in protein than in calcium. Ounce for ounce, it supplies nearly as much protein as cheddar. The same amount of cream cheese provides only about one-third as much protein as cheddar.

VITAMIN A IN CHEESE

Most of the firm cheeses are made of whole milk; cream cheese is made entirely or largely of cream. All of these cheeses contain a good amount

Canada's Food Guide suggests cheese as a substitute for meat and also recommends at least three servings of it for its own sake each week. Cheese can also serve as a substitute for milk.

Cut off a small piece of cheddar cheese about the size of a small pea. Impale it on a metal skewer or a large, straightened-out safety pin. Burn the cheese in a candle or other flame. What does it smell like? Why does it?

Wrap another piece of cheese in non-shiny paper and leave it overnight in the room. What do you see on the paper the next morning? Why does this happen?

Cut a piece of cheddar cheese, measure it carefully, and leave it unwrapped in the room for one week. Then measure it again. Is it smaller or larger? Why do you think it has changed in size? Does it feel firmer or softer than when you first cut it? Why has this change occurred?

of vitamin A, about 400 I.U. in a one-ounce serving. This is about one-seventh the recommended daily quota of this vitamin.

Cottage cheese is made of skim milk, but many brands of cottage cheese have about 4 percent of cream thoroughly mixed into them. Labelled as 'creamed,' they have a smoother texture and contain a small amount of vitamin A.

Calories in Cheese

One ounce of cheddar, of whole milk process cheese, of the firm fancy cheeses, or of cream cheese, provides about 100 calories. The same-sized serving of skim milk process cheese has about half as many calories. It is thus an excellent spread for weight-conscious people. Cottage cheese is even lower in calories, 25 calories per ounce if uncreamed or 'dry,' or 30 per ounce if creamed. However, the cottage cheeses have less food value than the firmer cheeses and the spreads.

COMPARING THE FOOD VALUE OF COMMON CHEESES

	CALCIUM	PROTEIN	VITAMIN A	APPROXIMATE CALORIES PER OUNCE
Cheddar	High	High	High	100
Whole Milk Process	High	High	High	100
Skim Milk Process	Very High	High	Low	55
Cheese spread	Medium	Medium	Medium	90
Cottage	Low	Medium	None or Low	25–30
Cream	Low	Low	High	100

DIGESTION OF CHEESE

Some people believe that cheese and milk tend to cause constipation. However, research on both experimental animals and human beings provides good evidence that these foods actually help to prevent constipation. Cheese has also been called indigestible. This, too, is incorrect: two-year-old children can digest soft mild cheese easily.

STORING CHEESE AT HOME

Except for unopened process cheese and the very strong cheeses, all other types should be kept in the refrigerator.

Cottage and cream cheeses are always kept in the refrigerator and are best used within a week. They are both served cold. For full flavor, the firmer cheeses are best taken out of the refrigerator at least half an hour before they are served.

The ripening processes do not stop when cheese is removed from the curing rooms and proceeds faster at room temperature. Wrapping cheese carefully in wax paper, plastic film, or foil helps to keep it moist and considerably reduces mould formation. Any mould that forms is harmless but it does spoil the appearance of the cheese; mould can be scraped off before the cheese is served.

If cheese is kept at room temperature, especially in warm weather, its fat may separate out. This results in the paper wrapped around cheese looking greasy after a time. Unopened process cheese, however, keeps well for months without refrigeration.

COOKING WITH CHEESE

Cheddar cheese becomes stringy and tough when overheated due to the effect of heat on its proteins; its fat also separates out. For this reason, process cheese is often preferred for cooking.

Cheddar cheese blends better in sauces if it is grated before being added to the mixture. If grated first and then added to the hot liquid at the end of the cooking time, it melts quite readily and will not be cooked long enough to toughen its proteins.

Cheese can flavor many foods: as a sauce with vegetables; as a grated garnish for soups and spaghetti; as a base for soufflés, fondues, rarebits, omelets, and pizzas; and, as one of the ingredients in salads and baked goods such as muffins, tea biscuits, and bread.

YOGHURT

Another 'cultured' product, yoghurt, has a smooth soft-solid consistency and a mild sour taste. It is often made of partly-skimmed milk and its food value is that of buttermilk or 2-percent milk. Commercial yoghurt usually costs at least three to five times as much as 2-percent milk. Yoghurt made of whole milk is much the same yet offers somewhat higher calories and vitamin A value.

Yoghurt, in addition to being more expensive to buy than milk or buttermilk, is no better, nutritionally, than either.

Centuries ago yoghurt was a common food for people in the Balkan countries who had discovered that the only way they could keep their milk in a safe, useable form was to sour it. About the beginning of this century, yoghurt was introduced into Western Europe, and was hailed as a valuable health-giving food. Actually, it has no special virtues beyond those of 2-percent milk or buttermilk.

Today, some people buy the necessary culture and equipment for making yoghurt at home, but this process takes time, patience, and skill.

CREAM

Because cream has more fat than does milk, it costs more and has more calories.

COMMON TYPES OF CREAM

	PERCENTAGE OF FAT (APPROXIMATE)	CALORIES IN 2 TABLESPOONS
Whipping Cream (unwhipped)	32	90
Table Cream (coffee or light cream)	18	50
Sour Cream (table cream soured by adding a special culture of harmless bacteria)	18	50
Cereal Cream or Half and Half (equal parts of table cream and whole milk)	10	35

ICE CREAM AND ICE MILK

While brick ice cream is being made, air is whipped into it so that ice crystals will not form.

Brick ice cream usually is 10 to 13 percent fat; one half of a pint of it has about as much calcium and protein as a cup of whole milk, but with twice the calorie count. The fancy types of ice cream have even more butter fat in them, and are again more expensive and higher in calories.

Ice milk is similar to ice cream but has only 3 percent or less fat content. Some types provide about three-quarters of the calories of ice cream in the same-sized serving, at less cost.

The safety and the composition of both ice cream and ice milk are controlled by regulations passed by the Food Directorate of the Federal Health Protection Branch. The aim of this organization is to ensure that all foods are safe to eat and that the public is not misled or defrauded. Their regulations state that ice cream must contain at least 10 percent fat and a specified amount of dried skim milk. They permit ice cream to contain some forms of sugar for sweetness and a stabilizing agent for firmness. One such stabilizer is gelatin; another is made from seaweed and is called an alginate. Other regulations ensure that all ice cream is made in very sanitary factories, visited at intervals by health inspectors.

BUTTER

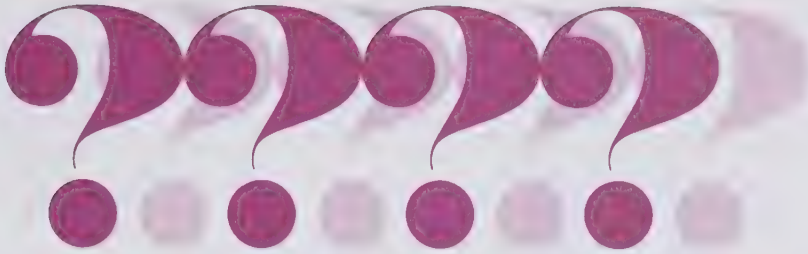
The most concentrated form of milk fat eaten is butter. It is about 80 percent fat and contains much vitamin A; most of the rest of it is water. Butter cannot take the place of milk, as it has practically no calcium, riboflavin, or protein. One tablespoon, half an ounce, of butter supplies about one-fifth the daily quota of vitamin A.

While both butter and margarine are 80 percent fat, and are equal in vitamin A content, butter has almost no vitamin D. This vitamin has been added to some brands of margarine. In addition to most margarines being less expensive, the soft margarines are high in unsaturated fats.

MARGARINE

Most margarines contain a fair amount of skim milk and are a less expensive alternative to butter. They are more healthful than butter, especially those containing liquid oil and a high percentage of polyunsaturated fatty acids.

All Canadian margarines are fortified with sufficient vitamin A to equal the year-round average of butter in this respect. Some of them have had 110 to 140 units of vitamin D per ounce added as well.



1. Answer true or false and give reasons for your answer.
   a) Cheese is indigestible.
   b) Yoghurt is better than any kind of milk.
   c) Butter gives you extremely little calcium, riboflavin, or protein.
   d) The margarines, especially those containing a high percentage of polyunsaturates, are better foods than butter.
   e) A quarter-brick helping of the ordinary type of ice cream gives you 160 calories.
2. Suggest three main dishes containing cheese that you could serve as a substitute for meat. Prepare one, serve it to your family, and decide if you are pleased with the results. In what nutrient is cheese not the equal of meat? In what way could you add this almost-missing nutrient to a cheese dish?
3. Compare the price per ounce of yoghurt with that of 2-percent milk.
4. Find out how much money you save by buying ice cream in a larger-sized carton.
5. Make a list showing the different kinds of oils and fats used in making the different brands of margarine. Also, note which brands have had vitamin D added. Calculate how much vitamin D one ounce (2 tablespoons) of margarine contains.
6. Compare the cost per serving of canned macaroni, macaroni and cheese bought in one package, and the macaroni and cheese you make yourself from 'scratch.'
7. Spread several small pieces of bread with butter and a similar number with margarine. Blindfold your classmates and see if they can tell which is which. Repeat the same test on the same person at least twice.
8. A half pint of whipped cream makes about 16 servings, each providing about 48 calories. Compare the cost and calories of similar-sized servings made of whipped dried skim milk and of the pre-packaged synthetic whips.
10. Have a cheese-tasting party at school. Make a chart with six columns in your notebook. Head the different columns as follows – Name, Where Made, Appearance, Texture, Taste, and Price per Ounce. After you have tasted each cheese, fill in each of the columns. How many of the kinds brought to the party had you tasted before? One member of the class could read about the history of a particular kind of cheese and discuss it with the rest of the class.
11. Another member of the class might talk about how and why Canadian eating habits are changing, and how 'Canada's Food Guide' can be adapted to suit the changes.

Although most of the fruit on the market is graded under the direction of government inspectors, it is often hard for consumers to determine the grade of fruit they are buying. Besides, the grading is often based on the size of the fruit and the excellence of its appearance. Neither of these qualities guarantees a good flavor and, of course, the top grades are the most expensive.

CHOOSING AND STORING RAW FRUIT

It is most important for consumers to learn how to recognize freshness in fruits and how to detect bruising. If fruit is bruised or looks softer than is normal, much of the vitamin C has been lost and the fruit will not keep well. Picking over any raw fruit regularly will save unnecessary waste.

Most people prefer to buy baskets of peaches that have some unripe ones in them, as the unripe ones will ripen if kept in a moderately warm place. Ripe and bruised peaches should be refrigerated unless they can be eaten immediately.

Apples that are ripening so fast that they cannot be eaten quickly enough also need to be refrigerated, but should be put in the crisper or in some other tight container as their aroma can flavor other foods. The same precaution needs to be taken with pineapples and cantaloups.

Bananas, in contrast, ripen better out of the refrigerator. Once the skins have become flecked with brown, indicating ripeness, the bananas are better transferred to the refrigerator.

A pineapple is ripe if its leaves pull out easily and if it has a fragrant aroma; at that stage, its flesh will be yellow and juicy.

An orange that feels heavy for its size and that has a relatively thin skin is usually a good buy.

Grapefruit that are heavy for their size and that have 'rusty' or bronze patches on their skins are usually juicy.

The freshest looking strawberries and raspberries are the best choice. If berries are over-ripe or soft or damaged, much of their vitamin C will have been destroyed by the enzyme released by the damaged cells. It is best to store the berries, unwashed, in a large-sized bowl to reduce the pressure on them. They may be washed and hulled just before serving.

"Due to climatic conditions, the areas in Canada suited to the growing of fruit are limited. Apples and small fruits are grown in Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia. Tender tree fruits and commercial vineyards are restricted largely to Ontario and British Columbia.

Apples are by far the largest fruit crop produced in Canada. Sixty-seven per cent of the crop enters the fresh fruit market; 33% is processed. Other fruits in order of quantity produced are grapes, peaches, pears, strawberries, cherries, blueberries, raspberries, plums, prunes and apricots.

In spite of the highly localized areas of production, the fresh fruit is distributed to all areas of the country."

Botanists classify tomatoes as fruits, though many people think of them as vegetables. As field-ripened and canned tomatoes and tomato juice contain about 20 mg of vitamin C per 100 cubic centimetres or per 100 grams, servings of them should be somewhat larger than four ounces. Small field-ripened cherry tomatoes contain twice the vitamin C of ordinary tomatoes; imported tomatoes, which are picked before they are ripe, and hothouse tomatoes are lower in vitamin C.

NUTRIENT CONTENT OF FRUIT

Most people like fruits probably because they are sweet; their sugar content varies from about 5 to 17 percent. Because the major ingredient in all raw fresh fruit is water, all of them are low calorie foods. Depending on type and size, an average serving of them provides only 35 to 75 calories.

A fair number of fruits are rich sources of vitamin C, a few of vitamin A, and all add some thiamin, iron, and other nutrients.

Because all contain a fair amount of cellulose, which gives fruits their firmness and shape, raw fruits are quite filling. Nearly all of the cellulose, the natural covering and framework of any fruit, passes through the digestive tract unchanged, but the residue that it provides has the ability to hold water almost like a sponge, helping to prevent constipation.

Vitamin C in Fruit

Most North Americans obtain a very large proportion of their vitamin C from fruits and their juices.

The common fruits may be divided into four groups according to the amount of vitamin C an ordinary serving of them would contain. One half cup or four ounces of one of the fruits in the first group would be a good source of vitamin C if taken daily. An alternative would be a similar serving of any one of the first six fruits in the second group.

(1) 30 mg TO 50 mg OF VITAMIN C PER SERVING

Apple juice, vitaminized
Orange juice, fresh, frozen, or canned
Orange, 1 medium
Grapefruit juice, canned or frozen
Blended orange and grapefruit juice
Grapefruit, 1/2 small
Tangerine juice, canned
Strawberries, fresh or frozen
Cantaloup, 1/2 small
Red currants, fresh

(2) 11 mg TO 25 mg OF VITAMIN C PER SERVING

Raspberries, fresh or frozen
Tangerines, 1 medium
Pineapple, fresh
Honeydew melons, 1/4 medium
Tomatoes, fresh, canned or cooked
Tomato juice
Blueberries, fresh or frozen
Bananas, 1 large

TABLE CONTINUED

Canada's Food Guide *recommends two daily servings of fruit or juice, including a satisfactory source of vitamin C, such as oranges, tomatoes, or vitaminzed apple juice. Usually, a juice glass holds about 4 ounces. Following this advice, one obtains 30 milligrams or more of vitamin C a day, which is probably sufficient. As experts of several countries advise twice this amount, this question is not as yet finally decided.*

Vitamin C does a great many different jobs in the body, although it is not known how it accomplishes many of them. From studies with young guinea pigs, who need to eat it in their food just as we do, scientists know that vitamin C is one of the many nutrients that are essential for normal growth. Vitamin C is also needed for the development of normal dentine in the teeth. Babies, who are not given vitamin C, develop the painful deficiency disease called scurvy.

Some years ago, at The Hospital for Sick Children in Toronto, the vitamin C content of thirty-five varieties of Ontario apples just after harvesting was measured. Only six of the popular varieties were high in this vitamin; nearly all the others contained less than 10 mg in each apple. After storage at 32° Fahrenheit for six months, the four best eating and cooking apples still retained at least three-quarters of their original vitamin C.

BEST USE	VARIETY	VITAMIN C PER APPLE IN MG
eating and cooking	Northern Spy	27
	Red Spy	
	Geneva	23
	Baldwin	27
	Wagner	37
cooking	King	15
	Ontario	37
eating	Delicious	5
	Golden Delicious	9
	McIntosh	3.5
	Snow	3.0

(3) 10 mg OR LESS OF VITAMIN C PER SERVING

Pineapple juice, canned
Plums, 3 fresh
Apricots, 2 fresh
Watermelon, 1/2 slice, 6" long, 3/4" thick
Peaches, 1 medium, fresh
Cherries, 1/2 cup, fresh
Pears, 1 medium, fresh
Grapes, 1 medium bunch

(4) LITTLE OR NO VITAMIN C PER SERVING

Dried
Apples
Apricots
Prunes
Raisins
Currants
Dates
Figs

Raw apples are not included since the different varieties of apples vary a great deal in the amount of vitamin C that they contain.

AVERAGE AMOUNTS OF VITAMIN C IN ONTARIO STRAWBERRIES

Raw, very fresh, 1/2 cup	74 mg
Frozen, 1/2 cup	60 mg
Canned, 1/2 cup	35 mg
Jam, 1 heaping tablespoon	2 mg

The table shows what happens to the vitamin C in strawberries, which are rich in vitamin C, when they are frozen, canned, or made into jam. The berries were grown and processed at the Horticultural Experimental Farm at Vineland, Ontario; the vitamin C measurements were made at The Hospital for Sick Children, in Toronto.

When apples are baked or cooked, about 80 percent of their vitamin C is lost. Therefore, to obtain the most vitamin C, it is best to eat apples raw, skin and all, within six months after they are harvested.

Vitamin A in Fruit

The vitamin A value of a fruit depends on the amount it contains of a bright yellow, carrot-colored substance called carotene, much of which is converted into vitamin A in the body. Consequently, all the dark yellow-fleshed fruits, especially cantaloup and apricots, have high vitamin A values. One serving of either cantaloup or apricots will provide the vitamin A daily quota. The next best choices are yellow peaches and watermelon. A red pigment masks the characteristic yellow color of carotene in the watermelon. Fair sources of vitamin A are tomatoes, prunes, bananas, cherries, oranges, and yellow-fleshed plums. A third group, which includes apples, pineapples, raspberries, grapes, and honeydew melons, adds low amounts of vitamin A.

Fortunately, carotene can withstand boiling, canning, drying, and freezing.

Vitamin A is needed to keep the lining layers of the mouth, nose, and lungs in their normal moist state. As these layers are one of the body's first lines of defence against harmful germs, it is important to keep them in excellent shape. Vitamin A plays a similiar role in keeping the lining of the eyelids and the surface of the eyeballs in healthy condition.

PROCESSED FRUIT

Dried Fruit

Dried fruits, such as raisins and prunes, if eaten raw, are highest in iron because so much of their water has been removed in the drying process. These fruits are also about 70 percent sugar and, thus, high in calories. Unfortunately, because dried fruits stick to the teeth and are so sweet, they can lead to tooth decay unless the teeth are cleaned or rinsed promptly.

Fruit Juices

The term 'juice' means that all the fluid in the product comes from the fruit itself; no water is added.

Raw apples, grapes, and most other raw fruits and vegetables, lose practically all their vitamin C when they are juiced, grated, or ground in a blender. When the cells which make up these raw foods are broken or damaged, an enzyme that destroys vitamin C becomes active. The citrus fruits and tomatoes do not contain this harmful enzyme and so retain their vitamin C when they are processed.

PROCESSING AND ITS EFFECT UPON THE VITAMIN C IN RAW FRUIT

3 1/2 OZ. APPLE	
raw whole: 9 mg	*ground: 0.5 mg*
raw whole: 11 mg	*juiced: 0.3 mg*

Tests with other fruits and vegetables showed that grating, grinding, or juicing these foods resulted in similar large losses of vitamin C.

3 1/2 OZ. TOMATO	
raw whole: 26 mg	*juiced: 25 mg*

Raw citrus fruits and tomatoes can be juiced with very little loss of vitamin C.

Vitaminized apple juice, a good alternative to the citrus juices, was invented in Canada and was first sold on the retail market shortly after World War II. Regulations passed by the Food Directorate and the Canada Department of Agriculture cover this standardized product. It cannot be sold as vitaminized apple juice unless it meets these regulations. The label on vitaminized apple juice must state that it contains "not less than 35 mg of vitamin C per 100 cubic centimetres." In fact, vitaminized apple juice must still contain that amount of the vitamin one year after it is canned. To ensure this, the canner usually adds a little more vitamin C as insurance.

VITAMINIZED APPLE JUICE

In the production of vitaminized apple juice, vitamin C is added since apples lose almost all of this vitamin when they are juiced and because many apples contain little of it even before juicing. The synthetic vitamin C that is added is identical to naturally-occurring vitamin C; both have the same effect in the body.

Just recently, a juice labelled "pure apple juice, vitamin C added," but not "vitaminized apple juice," has appeared on the market. If one examines the label further, one can see that it contains only 18 mg of vitamin C per 100 cubic centimetres, only half the amount present in vitaminized apple juice.

An opened container of any type of citrus or tomato juice can be kept in the refrigerator for 6 days with little loss of vitamin C from the juice.

Unfortunately, the vitamin C in vitaminized apple juice does not survive very well after the can has been opened; use within three days.

CITRUS JUICES

Citrus fruit juices that are freshly squeezed, cartoned, bottled, canned, or concentrated and frozen, all contain from 25 to 50 mg of vitamin C per 100 cubic centimetres in the form in which they are drunk. Though highest in vitamin C value are freshly squeezed orange juice and frozen orange juice, all the citrus juices are very good sources of vitamin C.

Freshly squeezed citrus juice is about 87 percent water. Its high water content makes it very bulky and its shipping charges are, therefore,

Citrus fruits were cultivated in southern Asia thousands of years ago. In fact, citrus fruit seeds, thought to be five thousand years old, were found in the excavations of the ancient city of Old Nippur in Iraq. The crusaders helped to introduce citrus-growing into southern Europe and the early Portuguese and Spanish explorers carried these fruits to the West Indies. From these islands, they spread to other parts of the New World. None of the citrus fruits is native to the Americas.

high. To reduce these costs and also, incidentally, to produce a more appetizing product, concentrated frozen citrus juice was invented. The citrus juice is concentrated by being boiled under a vacuum. In the vacuum, the juice boils at a temperature of about 167° Fahrenheit instead of the 212° Fahrenheit it requires in air. The lower temperature saves the maximum amount of the vitamin C. Just before being quick-frozen, a small amount of raw, freshly squeezed citrus juice is added to improve the flavor.

For serving, three cans of water must be added to one can of concentrated citrus juice. This means that the concentrated juice is itself four times as strong as the original juice. For frozen concentrated orange juice as it comes from the can, this figure is 200 mg of vitamin C per 100 cubic centimetres. Frozen orange juice, when diluted, is the nutritional equivalent of freshly squeezed orange juice and is considerably less expensive.

On the labels of some of the cans of citrus juice that are to be used in undiluted form, the so-called 'single-strength' juices, there is the statement, "made from concentrate" or "reconstituted." This means that the juice has been concentrated at a processing plant near the orchard and shipped to a canner some distance away. The canner then adds enough water to replace what was removed from the juice when concentrated, pours the juice into cans, and sterilizes it. Such reconstituted juices are usually a little lower in vitamin C than the original juices but the differences are small.

In addition to the vitamin C content, the citrus juices also provide some vitamin A, some of the B vitamins, a little iron and protein, and also considerable amounts of potassium which makes them especially useful for patients who are recovering from operations or who are being treated with cortisone or similar drugs.

Canada must import the common citrus fruits such as oranges, grapefruit, tangerines, lemons, and limes.

Nearly all tropical fruits, citrus fruits especially, are high in vitamin C. Tests have shown that small oranges and grapefruit usually have more vitamin C for the cost than do large or medium-sized ones. By cutting an orange or grapefruit and eating it with a spoon, or by peeling an orange and eating it in sections or slices, one obtains nearly 50 percent more vitamin C than by merely drinking the juice. Much of the vitamin C is in the pulp, the rind, and the skin around the sections, besides being in the juice.

In one Toronto study, carried out in the late winter, the amount of vitamin C consumed by individuals was actually measured, by chemical means, in duplicate servings of all the fruits and vegetables eaten in a day. This test showed that unless citrus products or vitaminized apple juice had been taken, 75 percent of the 100 individuals tested obtained 15 mg or less of vitamin C during the whole day.

OTHER JUICES

Mixed vegetable juices are combinations of tomato juice and such other vegetable juices as carrot and celery. Since the other vegetable juices are far lower in vitamin C than tomato juice, the total amount in the mixture is low. Some types of concentrated frozen pineapple juice, grape juice, and some mixed vegetable juices have had vitamin C added and this is stated on their labels.

JUICES NATURALLY LOW IN VITAMIN C*

TYPE	mg PER 100 CUBIC CENTIMETRES
Pineapple Juice	9
Grape Juice	trace
Mixed vegetable juices or cocktails	5 to 8
Cranberry Juice	2
Carrot Juice	trace

*The table shows the content of such products when no synthetic vitamin C has been added.

Fruit Drinks

There are many products not termed juices but fruit drinks, fruit cocktails, or nectars. The major ingredient of these products is always water, although a few of them do not state this on the label. Most do not indicate the amount of the concentrated juices they actually contain. Very often, the label lists white sugar and dextrose, both sweetening agents, and frequently citric acid and orange oil emulsion. The last two are flavorings and artificial colorings.

If vitamin C has been added, the maker so states, giving the amount on the label. A few of these products have as much as 40 mg of vitamin C per 100 cubic centimetres added; these, of course, are even a little better than vitaminized apple juice. Most contain 18 mg per 100 cubic centimetres or 20 mg per 4 ounces. If the label does not say that vitamin C has been added and the product is not called a juice, one can expect it to contain practically no vitamin C.

Frozen Concentrated Drinks

Many frozen products, sold under varoius trade names, but often described as 'Orange Breakfast Drink Concentrates,' contain, in the undiluted state, 75 to 97 mg per 100 cubic centimetres. These, of course, are less than half as strong as frozen concentrated orange juice. Concentrated frozen orange juice, in the can, contains about 200 mg of vitamin C per 100 cubic centimetres.

Dry Products

At present, all the dry products are made of sugar, artificial flavoring and coloring, and synthetic vitamin C. When mixed with water, according to directions, most of them provide about 30 mg of vitamin C per four-ounce glass or 26 mg per 100 cubic centimetres, about half the amount in freshly squeezed or diluted frozen orange juice. Although the cost is similar, orange juice has the great advantage of containing many other nutrients besides vitamin C.

Canned Fruit

Canned citrus fruits and tomatoes retain most of their vitamin C value. However, those fruits, such as mandarin oranges and grapefruit, canned with sugar syrup added, provide less vitamin C than they would if eaten in raw form. Although the added syrup is devoid of vitamins, some of the vitamin C of the fruit seeps into it in the canning process. When other fruits are canned, a fair amount of their original vitamin C is lost.

Jams, fruit jellies, and marmalades contain very little vitamin C and servings of them are usually small. These preserves are also 65 to 70 percent sugar.

HOME CANNING

Fruits, because they contain acids, are easy to bottle or can at home. The mild acids found in almost all fruits are completely burned up in the body and the final effect of them is not acidic, but just the opposite, that is, slightly alkaline.

Pamphlets on how to can fruit may be obtained from the Department of Agriculture.

COMMERCIAL CANNING

Nearly all the canned fruit on shelves is graded 'choice;' a few are graded lower and are labelled 'standard;' a few are graded higher and are called 'fancy.' All of them are safe and tasty. Most brands of peaches are canned in 45 percent sugar syrup, that is, in water containing 45 percent sugar. If canned in sugar syrup, the calorie count of a fruit is doubled.

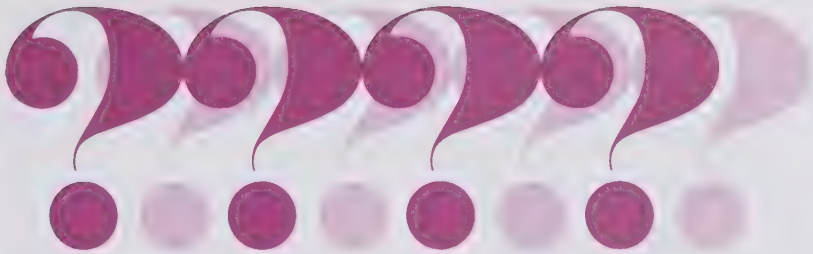
Frozen Fruit

Freezing is the best method for preserving the nutrient value of a food but to obtain the best-tasting product, the food needs to be very fresh. With this in mind, commercial freezing companies process their fruit very soon after it is picked.

Freezing does not improve the quality of the fruit. Unless one grows fruit at home or can pick it oneself, it probably does not pay to freeze fruit at home.

Frozen fruit should be kept frozen solid until just before being used. For maximum food value and flavor, frozen fruit should be served as soon as thawed, or even when a few particles of ice still remain.

Both the Canada Department of Agriculture and most of the provincial Agriculture Departments have published pamphlets on how to freeze foods. These publications are either free or available at very little cost.



1. Answer true or false and give reasons for your answer.
   a) Frozen orange juice has less vitamin C than does fresh orange juice.
   b) The dried orange-flavored crystals with vitamin C added have as much nutritive value as does orange juice.
   c) Grapefruit in a reducing diet helps to dissolve your unwanted fat.
   d) All fruits are equally rich in vitamin C.
2. Explain the differences between a juice and a fruit drink. What are Food Directorate's regulations concerning them?
3. Name five juices that are high in vitamin C; name three juices that are low.
4. Buy one each of an orange breakfast drink concentrate containing 97 mg per 100 cubic centimetres of vitamin C before dilution and a frozen concentrated orange juice. Compare their vitamin C content in a four-ounce serving, when diluted according to directions, and then taste each to compare flavor. Compare their cost.
5. Compare the cost of one medium-sized orange, one-half of a medium-sized grapefruit, four ounces of cartoned orange juice, four ounces of home-squeezed orange juice, four ounces of diluted frozen concentrated orange juice, and four ounces of vitaminized apple juice.
6. Why does vitamin C have to be added to apple juice?
7. How would you compare a can of apricots labelled 'choice' with a can labelled 'standard.'

4 Vegetables

CHOOSING VEGETABLES

To be assigned the top grade, produce must meet high standards of excellence. Usually such vegetables must be over a stated minimum size, have a very good appearance and be free from even minor defects. However, the lower grade or even ungraded vegetables can be perfectly satisfactory if one knows how to judge soundness and freshness. If, for example, the leaves of carrots sold in bunches are wilted or broken and the ends of the carrots are wizened and brown, they are not fresh. Similarly, if stored carrots, with their tops cut off, show young sprouts at their tops and soft spots at their ends, they have been out of storage for too long a time. An experienced shopper examines squash, sweet potatoes, and tomatoes for any soft spots before buying them. When potatoes are exposed during growth to sunlight, their skins and their sprouts turn green. This unsightly, slightly poisonous green material has to be pared off.

Vegetables sold in bags, boxes, or baskets usually show the grade mark on the container and often the name and address of the grower as well. Unless the grade is shown on the signs posted near the produce, vegetables sold in bunches, by the pound, or loose, are not labelled as to grade.

"Potatoes are the major vegetable grown in Canada. New Brunswick and Prince Edward Island are the principal producers with 42% of the crop, followed by Ontario, Quebec, Alberta and Manitoba.

Other vegetable crops are produced in all provinces with Ontario and Quebec having more than 80% of the total commercial acreage. Tomatoes are the major crop, followed by carrots, corn, onions, turnips, cabbages, cucumbers, peas, beans, lettuce, beets, cauliflower, celery, parsnips, spinach and asparagus."

The Departments of Agriculture have established grades for fresh vegetables, both native-grown and imported. Usually only two grades are used: 'Canada No. 1' and 'Canada No. 2.' Growers can usually obtain a higher price for 'Grade No. 1.'

STORING VEGETABLES AT HOME

The widest variety of vegetables is available during the summer and autumn; any vegetable is cheapest when it is most plentiful. While a number of them can be stored commercially for many months, many other vegetables cannot be stored. Today, few households have a cold cupboard or other suitable storage space in which to store large quantities of vegetables at home. Therefore, vegetables must be bought in the amounts that can be used before they begin to decay.

NUTRIENT CONTENT OF VEGETABLES

All fresh, cooked, canned, or frozen, but not fried or candied, vegetables are low in calories because they are approximately 70 to 95 percent water. Individually, vegetables vary in nutrient content. Some provide much vitamin C, other are very rich in vitamin A value. Still others add unusually high amounts of iron or of thiamin or even of protein. All are good sources of cellulose.

Canada's Food Guide suggests "one serving of potatoes and two servings of other vegetables, preferably yellow or green and often raw" every day.

Vegetables are valuable foods since:

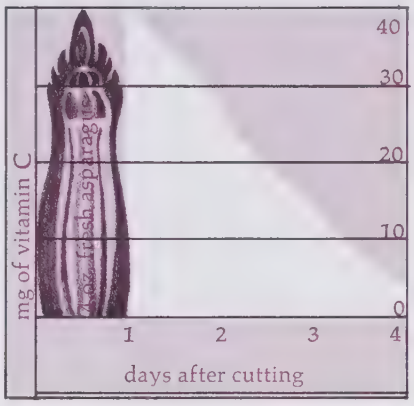
- ☐ *they contain few calories unless they are fried or candied*
- ☐ *some are high in vitamin C*
- ☐ *some are rich in vitamin A*
- ☐ *some add considerable iron and thiamin*
- ☐ *some are good in protein*
- ☐ *all add cellulose*

Vitamin C in Vegetables

Except for citrus fruits and tomatoes, fruits and vegetables contain an enzyme that destroys vitamin C when the cells that make up these foods are damaged or die. When a vegetable wilts, becomes discolored, or is bruised, this indicates that many of its cells have been so injured.

In areas where citrus fruits or juices high in vitamin C are expensive or not easily available, it is especially important to know how to obtain the maximum amount of vitamin C from vegetables. When vegetables are cooked in ways that prevent loss of vitamin C, their appearance and flavor also benefit.

Though all vegetables, except for dried beans, peas, and lentils, contain vitamin C, a number are especially rich in it. The usual-sized, field-ripened tomatoes are good sources of vitamin C, but the small varieties, sometimes called red cherry or red currant types, contain two or three times as much. Additional sources include new potatoes and all the members of the cabbage family: turnip, cabbage, cauliflower, Brussels sprouts, broccoli, and kohlrabi. Commercially-stored cabbage and turnips retain their vitamin C for months but, unfortunately, potatoes lose a fair amount in prolonged storage. Spinach and asparagus are only high in vitamin C when really fresh. Tests have shown that really fresh spinach is almost as high as cabbage in vitamin C, but after only one day's storage about half of this has gone. Still more disappears when it becomes older or when it wilts.



If raw fresh asparagus is kept for 4 days at store temperature, it loses about 90 percent of its vitamin C.

SAVING VITAMIN C IN VEGETABLES

In storing raw vegetables

Vegetables, especially greens, should be put as soon as possible in the crisper or other suitable closed container in the refrigerator to reduce the wilting as much as possible.

In preparing raw vegetables

Grating, grinding, or juicing almost completely destroys the vitamin C in nearly all raw vegetables. Putting raw vegetables through a blender has the same harmful effect. Yet, if the vegetables are cooked first, the harmful enzyme is destroyed by the heat.

PROCESSING AND ITS EFFECT UPON THE VITAMIN C IN RAW VEGETABLES

3 1/2 OZ. POTATO	
raw whole: 30 mg	*grated: 4 mg*

Experiments with raw celery, spinach, cucumber, and lettuce showed that grating, grinding, or juicing any of these foods resulted in similar large losses of vitamin C.

One obtains the most vitamin C from vegetables by eating them raw, but if they are to be prepared, the method of preparation does make a difference. Salad vegetables should be cut with a very sharp knife to damage the vegetable cells as little as possible. Cutting with a dull knife or chopper injures far more of the vegetable cells and, thus, liberates more of the vitamin C-destructive enzyme.

SALAD FOODS HIGH IN VITAMIN C

BASES	*Cabbage, raw*
	Tomatoes, field-ripened
	Tomato jelly made from canned tomatoes or tomato juice
	New potatoes, boiled in their skins and used the same day
	Cantaloup
	Grapefruit
	Oranges
GARNISHES	*Red or green peppers, fresh*
	Parsley
	Watercress
	Brussels sprouts, raw
	Cauliflower, small flowers of
	Onions, young green

SALAD FOODS LOW IN VITAMIN C*

Lettuce
Carrots, raw
Radishes
Cucumbers

*Although low in vitamin C, these foods add to the good appearance and flavor of salads.

In cooking

Some vitamin C is always lost in cooking, but the losses can be minimized.

WITH WATER – Use the least possible water in cooking vegetables. Vitamin C dissolves very readily in water. Just as half a cup of sugar dissolves far more easily in a quart of water than in a cup of water, the more cooking water used, the more vitamin C escapes into the water. If, for example, one cooks cabbage in a small amount of water, just until tender, about half of its vitamin C will escape into the water. As compensation for this, most people eat twice as much cabbage cooked as raw. If cabbage is cooked in a large amount of water, or the water is changed at some point, 80 to 90 percent of its vitamin C may be lost. With spinach, enough water for cooking clings to the leaves after they have been washed and shaken. If more water is added, up to two-thirds of its vitamin C may be lost. One should use just enough water to cover the vegetables.

Unless a saucepan with a tight lid is used, the heat must be controlled to avoid the saucepan boiling dry. Besides, gently boiling water is just as hot as rapidly boiling water which is more apt to break down the vegetable and, thus, let more vitamin C leak out.

☐ Leave the skins on vegetables. Potato skins, for instance, can serve as a barrier against the escape of vitamin C into the water. By cooking potatoes in their skins, about 15 percent more of the potato is saved.

☐ Do not cut vegetables into small pieces. With large vegetables that have to be cut up, leaving the pieces as large as possible, saves more vitamin C. Each cut surface is an exit or escape hatch for the vitamin C to pass into the water.

☐ Do not overcook vegetables. Overcooked vegetables begin to break down, making it easier for the vitamin C to escape into the water. As timing is important, testing the vegetables for 'doneness' at the nearly-cooked stage is a good idea.

☐ Use the cooking water. No matter how many precautions are taken to conserve vitamin C in cooking, there will always be some of it in the cooking water. The water in which turnips, for instance, have been cooked always contains 30 to 40 percent of the vitamin C originally present in the raw vegetable.

☐ Always start with boiling water. Cutting a vegetable always damages some of its cells, the injured cells releasing an enzyme that destroys vitamin C. Fortunately, this enzyme, as it is a protein, is itself destroyed at a temperature of 185° Fahrenheit. If the vegetable is placed in boiling water, 212°

VITAMIN C IN PROPERLY COOKED CABBAGE VEGETABLES AND POTATOES

brussels sprouts	70 mg
broccoli	65 mg
cauliflower	65 mg
boiled new potato	30 mg
cabbage	25 mg
turnips	20 mg
boiled old potato	9 mg

mg PER AVERAGE SERVING ($1/2$ CUP)

Aluminum pots and pans are not harmful in cooking. Aluminum is insoluble and none of it can get into the cooking water or into any foods cooked in utensils made of it.

THE EFFECT OF COOKING TIME ON VITAMIN C IN $3\,1/2$ OZ FRESH CAULIFLOWER

cooked until just tender
65 mg vitamin C retained
0012

cooked twice as long
38 mg vitamin C retained
0024

27 MG VITAMIN C LOSS DURING EXTRA COOKING TIME

✱ *This and many other experiments with the cooking of vegetables were carried out in the Research Laboratories of The Hospital for Sick Children, in Toronto.*

Fahrenheit, and the water is brought back to the boil quickly, the enzyme will be destroyed. Starting with cold or merely warm water allows the harmful activity of the enzyme to increase until the water reaches 185° Fahrenheit.

□ Mashing harms vitamin C. Mashing hot vegetables such as potatoes or turnips whips air in amongst the particles of the hot vegetable. As a result, the vitamin C in being oxidized by the oxygen in the air is destroyed. If a mashed vegetable is kept hot in a warm oven, this harmful oxidation reaction keeps on occurring and there will be very little vitamin C left by the time it is served.

□ Do not add soda. Vitamin C is far more easily destroyed when an alkali, even such a weak one as baking soda, is added to the cooking water. Some people add a little soda to the water because it makes vegetables stay very green. However, if green vegetables are not overcooked, and an uncovered pan is used, the vegetables will retain their color very well. The use of soda also increases the rate at which thiamin is destroyed.

WITH OTHER METHODS – Vitamin C cannot escape into water if no water is used in cooking. Thus, waterless cooking and baking in the oven are good cooking methods, as is pressure cooking, because so little water is needed. In a pressure cooker, the vegetables are cooked quickly, mostly by steam. Firm vegetables, such as large beets, cook well in such utensils.

Potatoes are often baked but one can also bake carrots, parsnips, turnips, squash, mushrooms, and beets. These vegetables have a different taste, often sweeter, when cooked in this way. Carrots, parsnips, and turnips need to be peeled before baking; squash and beets are usually baked with the skins left on.

French-frying or cooking vegetables twice, by boiling and later frying or creaming them, for instance, increases the loss of vitamin C.

Overcooking a green vegetable in a covered saucepan often causes its green chlorphyll to change to a grayish or yellowish pigment. This happens because acid substances, driven off in the steam, condense on the underside of the lid and then drop back into the water where they speed up the change.

Overcooking also changes the flavor of vegetables. Fresh cooked peas or carrots, for example, have better flavor than do canned ones, which for the sake of safety have to be heated by the canner for considerable time.

EFFECT OF COOKING METHOD ON VITAMIN C IN POTATOES

METHOD USED	VITAMIN C RETAINED
baked in jacket	90%
boiled in jacket	80%
peeled + boiled	60%
peeled, boiled, + refrigerated 1 day	30%
peeled, boiled, + mashed	40%
french-fried	40%
scalloped	35%
pan-fried	20%
if kept hot 1/2 hour	an additional 20-30% loss

Even old potatoes are worth cooking right.

Vitamin A in Vegetables

The vitamin A value of vegetables is due solely to their carotene content, a large percentage of which is converted into vitamin A in the body. If fats such as margarine, butter, gravy, or salad dressing are added to vegetables, it helps the body to absorb the carotene. Fortunately, carotene can withstand cooking, canning, freezing, and drying without harm.

Carotene has a characteristic deep yellow, carrot-like color. The vegetables whose flesh is a deep yellow color are very rich in carotene. These include carrots, sweet potatoes, squash, and pumpkins. The deeper the color, the higher the vitamin A value. The dark green vege-

tables such as spinach, chard, beet greens, and broccoli are also rich sources although their green chlorophyll masks the yellow color of the carotene. Vegetables with only moderate vitamin A value are much paler in color, with the exception of tomatoes, which contain a red pigment that is unrelated to carotene. Those vegetables with low vitamin A value are again even paler in color.

VITAMIN A VALUE OF VEGETABLES

HIGH	MODERATE	LOW
Carrots	*Tomatoes*	*Wax beans*
Spinach	*Asparagus*	*Cabbage*
Sweet Potatoes	*Peas*	*Onions*
Chard	*Celery*	*Potatoes*
Squashes	*Green Beans*	*Beets*
Beet Greens	*Turnips*	
Pumpkins		
Broccoli		

Other Nutrients in Vegetables

All vegetables provide some iron. Legumes and cooked greens, such as spinach, are especially rich sources of iron. Potatoes and green peas are especially high in thiamin. Peas, mature beans, lentils, and peanuts contain more protein than the other vegetables.

Those vegetables highest in iron include: spinach, beans, peas, and peanuts.

Those vegetables high in protein include: peanuts, beans, lentils, and peas.

Those vegetables high in thiamin include: potatoes and peas.

PROCESSED VEGETABLES

Although vegetables are processed by freezing and drying, canning is one of the oldest and cheapest methods of preserving vegetables.

Canned Vegetables

Before they are canned, vegetables are blanched either by exposure to live steam or by being dipped into boiling water. This treatment kills the vitamin C-destroying enzyme.

Vegetables, other than tomatoes, retain usually twice as much vitamin C and thiamin when cooked with care in the home; vitamin C and thiamin in tomatoes are reduced only slightly by canning.

As both vitamin C and thiamin dissolve in water, the fluid in the can contains a fairly large percentage of these vitamins. Vitamin A and iron content are little affected by canning, but some of the iron and other minerals will escape into the juice in the can.

To save thiamin in cooking vegetables, the same precautions as for vitamin C content should be observed.

Canned green peas labelled "special process" and "alkali added" are often a vivid green. However, the added alkali, probably soda, has destroyed much of the vitamin C and thiamin in the peas.

GRADING CANNED VEGETABLES

Canned vegetables are graded 'Fancy,' 'Choice,' and 'Standard.' The highest grade, 'Fancy,' is usually the most expensive; its contents are uniform in shape and size. 'Choice' and 'Standard' grades are just as safe, usually quite satisfactory, and several cents cheaper per can.

In addition to the grade, the label also lists the volume of the can, the size of the pieces or of the vegetable, any seasonings or condiments that have been added, and the name and address of the canner.

Storing canned vegetables and fruits in a cool place, preferably at about 50° Fahrenheit retains most vitamin content, even after a year. Freezing does not reduce vitamin content, but it does affect texture, making the vegetables mushy.

COOKING CANNED VEGETABLES

It is probably best to boil commercially canned vegetables other than tomatoes, in their own liquid for five minutes before serving them. If the liquid is drained or more water added, more of the nutrients from the vegetables will be lost.

When canned vegetables are used in casseroles, more of their food value is saved if they are cooked for as short a time as possible.

Quick-frozen Vegetables

'Quick-freezing' of vegetables is a better method of conserving both freshness of flavor and nutrient content than is canning. Unfortunately, some kinds of vegetables are quite unsuitable for freezing, and certain varieties of one vegetable freeze better than do others.

Before being frozen, vegetables are blanched to preserve their natural color, to kill the vitamin C-destroying enzyme, and to prevent the development of an unpleasant flavor.

Commercially-frozen vegetables are usually more expensive than canned vegetables but can add variety to winter meals especially, need no preparation, and most have no waste.

Freeze-dried Vegetables

Recently, some quick-dried, that is, freeze-dried, green peas and beans have appeared on the market. The peas have excellent color and flavor, but their appearance is not as good as that of frozen peas. Quick-dried peas also take a longer time to cook, are very expensive, and contain the least vitamin C.

GRADING FROZEN VEGETABLES

Frozen vegetable grades are 'Fancy' and 'Choice;' both are of excellent quality. Supermarket brands are often less expensive than most nationally-advertised brands. The large bags are usually the most economical.

COOKING FROZEN VEGETABLES

Frozen vegetables should not be thawed before cooking; they should go directly from the freezing compartment into boiling water. Only a short cooking time is required because the initial blanching, freezing, and the thawing during cooking, are equivalent to partial cooking.

Frozen vegetables should always be cooked in a small amount of boiling water in a saucepan with a tight lid.

COMPARING TYPES OF COOKED PROCESSED GREEN PEAS*

TYPE	VITAMIN C IN mg PER 1/2 CUP, COOKED	PREPARATION TIME IN MINUTES	FLAVOR AND COLOR	APPEARANCE	COST
Canned	9	2	Fair	Fair	These are listed in order of cost, from the least to the most expensive type.
Frozen	15	5	Very good	Excellent	
Quick-dried (Freeze-dried)	trace	15	Excellent	Fair	

*W. Mathews and D. Wells, *Second Book of Food and Nutrition*, "Home Economics and Domestic Subjects Review," (London: St. James House, 1971), p. 111.

PROCESSED POTATO PRODUCTS

It is interesting to compare instant mashed or flaked potatoes with home-cooked potatoes in food value. Some of the manufacturers state quite frankly that there is considerable variation in the vitamin C content of their instant potatoes, which is understandable if the potatoes are processed throughout the year. Of course, consumers have no way of knowing whether the products they have bought have been made from new or old potatoes. In addition, some of the methods by which instant potatoes are made save more of the vitamin C than do others and some of this vitamin may disappear after packaging. In the processing, there is always considerable loss of thiamin as well.

New potatoes, properly boiled or baked in their skins, definitely contain more vitamin C and thiamin than do instant potatoes. Home-cooked potatoes that have been peeled,

boiled, and mashed, may not be more nutritious than the instant types, but they do usually cost one-fourth as much per serving.

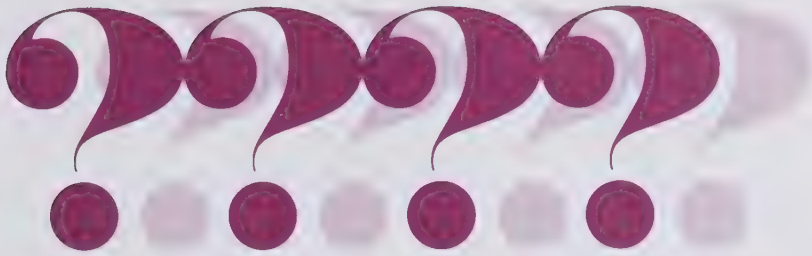
The other specially-prepared and packaged, as well as canned, potatoes, are also expensive when compared with raw potatoes. They may be useful as 'convenience' foods when time is very limited, or when a decorative touch is needed for various dishes or meals.

Many people look upon potatoes as high-calorie foods, yet this depends upon the methods used to cook and serve the potatoes. Since about three-quarters of a baked or boiled potato is water, it is relatively low in calories; a medium-sized potato provides only about 100 calories. Adding homogenized milk and butter to mashed potatoes increases the calories by about 20 percent, but even then, half a cup of potatoes is the caloric equivalent of just one slice of bread and butter. French-frying potatoes or making them into potato chips drives much of the water out of them and adds a great deal of fat. As a result, French fries and chips contain, ounce for ounce, respectively, four and eight times as many calories as boiled potatoes.

Just ten French fries contain almost twice as many calories as one medium boiled potato; seven large potato chips contain 110 calories.

COMPARING CALORIES
IN TYPES OF COOKED POTATOES

	CALORIES IN SERVING
baked, 1 medium	100
boiled, 1 medium	100
mashed, 1/2 cup (milk and butter added)	120
French-fried (10 pieces)	195
potato chips, 21 large	330



1. Answer true or false and give reasons for your answer.
   a) Eating carrots will guarantee a good complexion and glossy hair.
   b) Baking soda added to the cooking water destroys some vitamins.
   c) People are born with food likes and dislikes.
   d) Boiled potatoes are fattening foods.
   e) The dark-yellow vegetables have more vitamin A value than do cream-colored ones.
   f) You should thaw frozen vegetables before cooking them.
   g) Aluminum saucepans are an unwise kind of utensil to use.
   h) Fruits and vegetables are essential in well-planned meals.
   i) It is quite safe to leave food in opened cans in the refrigerator.
2. 'Canada's Food Guide' advises one serving of potatoes every day. Some people disagree with this. Two of you, one in favor of this advice and the other against it, could marshall all the arguments on each side and then discuss them in class. For nutrient information, refer to food tables.
3. Read all you can on how to make attractive salads. Then demonstrate the important steps to the class and discuss main course salads and side salads. You could also calculate the calories in a serving of one salad and also in the dressing added to it. Use food tables as your reference for the calorie counts.
4. Compare the cost per ounce of the same brand of the same vegetable bought in small, medium, and large-sized cans. What would determine the size bought by a shopper?
5. Discover the history of potatoes: where they were first grown and what they were like; theories on how they were taken to Europe; how long it took before they were accepted; and, their effect on the history of Ireland.
6. Collect as many labels as possible from canned and frozen vegetables. Read the information carefully. What does each label tell you?
7. Show the relationship between the losses in vitamin C content that occur when you peel, boil, and mash potatoes and then keep them in a warm oven for half an hour with the chemical properties of this vitamin. Explain why several other methods of cooking potatoes lead to a much greater retention of vitamin C.
8. How would you judge whether a head of lettuce, a pound of fresh green beans, a cellophane package of last season's carrots, or a pepper squash are good buys?
9. Describe at least three ways in which you can use the liquid from canned vegetables or the vegetable-cooking water.

10. Find out how vegetables can be cooked by panning and also by steaming. What effects do these methods have on their content of vitamin C?
11. Ask a local vegetable store owner to discuss with the class how, when and where he buys his vegetables, and what he does to keep them in good condition.
12. Each of you write down on a slip of paper all the fruits and vegetables you have eaten in the last 24 hours. Choose a class member to compile a list showing how many different fruits and vegetables were used and indicate how many class members ate each fruit and vegetable. How many of these fruits and vegetables are high in vitamin A?

Most grain foods are descendants of wild grasses. Grain foods are inexpensive to produce when compared to milk, fruits, and most vegetables. For this reason, they are used extensively throughout the world.

NUTRIENT CONTENT OF GRAIN

Water in Grain

When fully mature, grains are very dry, containing only about 12 percent water. If they are kept dry, they can be stored for months or even years.

Starch in Grain

Between two-thirds to three-quarters of the total weight of all the dry grains is starch. Starch, which is a carbohydrate, has a bland, almost tasteless flavor, allowing it to combine well with many other foods.

Proteins in Grain

All the grain foods do contain between 8 and 16 percent protein, the amount varying in the different kinds of grain. The primary purpose of the protein in the grain seed is for the growth of a new grain plant from the seed when it is sown.

Proteins are made of very long chains of amino acids which are broken apart in the digestive tract and then enter the bloodstream. In all animals, including man, the blood carries the amino acids to the body cells which recombine them in new ways to form all the particular proteins that they need.

Human beings are more like animals than plants in that the assortment of amino acids that make up the body proteins is more like the assortment found in foods of animal origin rather than in those of plant origin. Therefore, it is not surprising that foods such as milk and meat contain proteins that are more suitable for human growth and cell replacement than are grain food proteins. Most of the proteins in the grain foods either lack or are very low in one or more of the essential amino

acids. If, however, such foods as milk, meat, poultry, fish, eggs, or cheese are eaten at the same time as some grain food, the first group can make up for the amino acid deficiencies of the second.

Many North Americans obtain about one-fifth of their daily quota of proteins from grain foods.

Flours and cereals are eight to sixteen percent proteins. By themselves, these grain proteins are poorer building materials than are the animal proteins. However, when both grain and animal proteins are eaten together, at the same time, usually all of the proteins can be used for building cells, enzymes, antibodies, and other essential substances.

Fat in Grain

When harvested, all the grains are quite low in fat. Oats have a little more fat than the others, but not enough to increase significantly the calorie count.

Vitamins in Grain

The mature grain kernels contain good amounts of the B vitamins, especially of thiamin, and of iron. Only yellow corn, which is considered a grain when it is dry, has any vitamin A value. Unless allowed to sprout, none of the grains supplies any vitamin C, and none of them contains more than the merest trace of vitamin D. The whole kernels, especially of wheat, do provide some vitamin E, but human beings need little of this vitamin. Since enough vitamin E is obtained in other foods, whole wheat products need not be eaten specifically for this reason.

"Canada's principal grain crop is wheat. Annual production averaged about 680 million bushels during the 1960's. With domestic utilization accounting for approximately 170-180 million bushels during this period, wheat is the major agricultural export. Production is concentrated in the Prairie provinces, particularly Saskatchewan which grows more than 60% of the wheat."

VARIETIES OF GRAIN

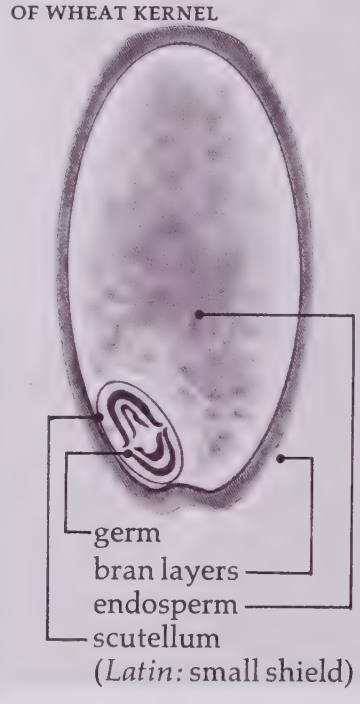
Wheat

EXAMINING A KERNEL OF WHEAT

Although they differ in shape, all the grain kernels (seeds) have four different parts. Many, but not all of them, also have a husk around the outside, which is removed before the grain is either processed or eaten.

A kernel of wheat, for example, when split vertically down the middle and examined under a microscope, reveals thin layers of brown bran around the outside. These layers contain considerable iron, thiamin, and other B vitamins. The large central part of the kernel, called the endosperm, is white. While the endosperm is mostly starch, approximately 12 percent of it is protein. The endosperm has little thiamin, some of the other B vitamins, and iron in it. The germ, (embryo) which is the part that sprouts when the grain is sown to form a new wheat plant in this instance, is near one end of the kernel. The germ is surrounded by a thicker mass of material called the scutellum. Nearly 70 percent of all the thiamin in the whole kernel is present in the germ and scutellum, which stick to each other when the grain is milled to be made into flour. These two parts also contain a good amount of iron. Together, in the case of wheat, they are sold as wheat germ.

SIMPLIFIED CROSS-SECTION OF WHEAT KERNEL



Rice

Plant breeders have now developed valuable new varieties of rice that contain a higher percentage of protein than do the common varieties. When they are able to distribute widely the seeds of this new type, it will be of great advantage to people who use rice as a staple, and whose meals are, consequently, often too low in protein.

THIAMIN AND IRON IN 1 CUP OF COOKED RICE

TYPE	THIAMIN	IRON
brown	0.122 mg	0.8 mg
converted	0.076 mg	0.3 mg
polished white	0.027 mg	0.3 mg
quick-cooking or instant	0.008 mg	0.3 mg
recommended daily amount for adolescents	1.000 mg	12.0 mg

TYPES OF RICE

Brown Rice – When rice is harvested, each kernel is surrounded by a husk, as are most other grains. The husk is always removed when the grain is for human use. The husked rice looks brown and is called brown rice. It is surrounded by several thin layers of brown bran; the germ is attached at the lower end of the kernel. Because the bran layers and the germ are still intact, brown rice is quite high in thiamin, other B vitamins, and iron.

Brown rice is more expensive than most other types of rice but adds flavor to casserole dishes, is a pleasant occasional alternative to potatoes, and can even be used in desserts, such as pudding.

Polished Rice – Because brown rice does not keep well when stored, especially in hot, humid climates, people living in the Far East developed methods for removing the bran and germ. One of the simplest ways of doing this was to add a little talc and then to rub the brown rice between sheepskins. By this means, the bran and germ were removed, and the white rice thus produced was called polished white rice.

The ordinary white rice sold in most stores is also polished rice, although efficient mechanical methods are now used for polishing it. It is far lower in both thiamin and iron than is brown rice. In fact, polished white rice contains so little thiamin that people who, due to choice or necessity, eat large amounts of white rice and little else, develop a serious and sometimes fatal disease called beri-beri. This disease is primarily due to a thiamin deficiency.

BERI-BERI AND THIAMIN

In 1882, Admiral Takaki, head of the medical service in the Japanese navy, discovered that if his sailors were given more vegetables, fish, and meat to eat with their white rice, they did not develop beri-beri. However, the admiral did not realize that the rice might be deficient in some needed nutrient; he believed that the prevention of beri-beri was due to the added proteins.

Long-grained white rice is not nutritionally superior to the less expensive shorter grain rice.

Converted Rice – Consumers can buy converted white rice which is superior in food value to ordinary white rice, although it is also more expensive. In making this type of converted rice, the rice kernels, with the husks still attached, are soaked in hot water under pressure. As a result,

much of the thiamin from the bran, germ, and scutellum seeps into the central part or endosperm of the kernel. Then, the rice is dried under a vacuum so that the heat can be kept relatively low. When dry, it is polished but some of the thiamin-rich scutellum still remains attached to the kernel, which now looks white. This converted rice contains almost as much thiamin as brown rice but not nearly as much iron.

Converted rice keeps its shape very well when it is cooked. Rice sold as "parboiled" is similar to converted rice.

Quick-cooking Rice – To produce quick-cooking rice, polished white rice is cooked in large amounts of water and then dried quickly by the use of considerable heat. This processing puffs it up so that it cooks more quickly and swells less. However, much of the original small supply of thiamin in the rice seeps out into the cooking water and more is destroyed by the high heat of the drying. Consequently, quick-cooking rice is even lower in thiamin than is polished white rice.

Other Grains

"Feed grains (corn, oats, rye, barley, mixed grain and buckwheat) are produced throughout Canada: corn and mixed grains are grown mainly in Ontario. The other grains are mainly produced in the Prairie region."

OATS

Due to the unusual shape of its kernel, the bran and germ of oats cannot be removed by milling. Consequently, flattened kernels of rolled oats and oatmeal, which is finely ground, are both whole grain products. They are even higher in thiamin and iron than is whole wheat.

Oats are used for making porridges, various kinds of cookies, and oat cakes. Sometimes, for economy, dried rolled oats are added to meat loaves and casseroles to extend the meat.

CORNMEAL

The cornmeal available in Canada has had its germ removed, but it retains its modified bran. Thus, cornmeal has a little thiamin.

Cornmeal contains no gluten so that, by itself, it produces quite firm baked goods. For lightness, then, cornmeal recipes often call for more enriched white flour than cornmeal. In baking with cornmeal, it is preferable to use baking powder, in which the acid and alkaline ingredients are evenly matched, than to use sour milk and soda. Because one cannot tell how sour the milk is, that is, how much lactic acid it contains, if too much soda is added, even when the recipe is carefully followed, the batter will be too alkaline. When this happens, much of the thiamin in the flour will be destroyed.

BARLEY, BUCKWHEAT, AND MILLET

These grains are not particularly valuable foods, although some health food advocates claim that millet, especially, is an unusually nutritious food. There is no scientific evidence to support this statement.

PROCESSED GRAIN

Flour

ENRICHED WHITE FLOUR

In making refined white flour, millers remove the bran, germ, and scutellum and use only 70 percent or so of the grain, the core portion. As a consequence, such unenriched white flour contains much less niacin,

thiamin, several other B vitamins, vitamn E, or iron than were originally present in the wheat kernels. Enriched white flour has had enough thiamin and iron added to it to equal whole wheat flour in these two nutrients. Millers also add to it more riboflavin than is removed in the milling. A little less niacin is added than is removed since many foods contain adequate supplies of it or of its substitute, tryptophan.

Since 1949, enriched white flour has been available in all parts of Canada. In many American states and in the United Kingdom, it is illegal to sell unenriched flour.

The enrichment of flour is controlled by Food and Drug regulations. A few small milling companies do not enrich their flour and consumers may be able to buy it at a lower price than nationally advertised brands of enriched flour. Buying such unenriched flour to reduce costs is unwise.

B VITAMINS AND IRON IN FLOURS

	100% — WHOLE WHEAT FLOUR	ENRICHED WHITE FLOUR
thiamin	equal	equal
riboflavin	lower	higher
niacin	higher	a little lower
iron	equal	equal

FLOUR ENRICHMENT AND THIAMIN

In the 1930s, many nutritionists became concerned about the possibility that people who were eating large amounts of white bread were obtaining too little thiamin. They tested out this theory in several ways. In one test, they fed a number of healthy volunteers a varied diet containing only white flour products and other foods that were low in thiamin. After some months, many of these volunteers developed such troubles as lack of appetite, constipation, undue fatigue, irritability, and inability to work as hard and as long as usual. When, without their knowledge, they were given extra thiamin, these symptoms disappeared. This test and other studies indicated that eating food which provided very little thiamin could be harmful.

By this time, the chemical formula of thiamin had been found after twenty-four years of painstaking research by an American chemist, Dr. R. R. Williams. He was soon able to make thiamin from simpler substances, and, thus, synthetic thiamin could be bought relatively cheaply.

The main function of thiamin is to enable body cells to obtain energy from the simple food substances that the blood brings them. The amount of thiamin that is recommended varies with the number of calories one eats. Everyone needs a good daily supply of thiamin since it cannot be stored in the body. A total of about 1 milligram a day would be sufficient for most people.

Bread

White wheat flour contains a substance called gluten, which consists of two different proteins. When such flour is made into bread dough by adding fluid, live yeast and other ingredients, the gluten absorbs the water and forms sticky strands. Gluten is an elastic type of protein which holds the dough together. It stretches when heat causes the dough to rise or to increase in size. This increase is due to the expansion of the air trapped in the dough, to the conversion of water into steam, and to the production of carbon dioxide by the yeast. As the bread becomes hotter in the oven, the gluten hardens and the yeast stops working, but the bread still holds its expanded shape.

Besides specifying the amounts of the three B vitamins and iron that must be present in enriched white flour, the Food Directorate of the Federal Health Protection Branch has passed additional regulations concerning bread.

Federal food experts allow commercial bakeries to add controlled, very small amounts of a number of substances to help keep bread from going mouldy or from becoming stale too quickly. That these substances are all harmless has been proved by long and careful scientific tests. Regulations have also been passed concerning the labelling of bread so that breads sold under standard names are standard products.

Bread made entirely of whole wheat flour does not produce nearly as porous a loaf as that made with white flour; other substances in the whole wheat interfere with the action of the gluten.

Rye flour contains much less gluten than wheat flour and, therefore produces a heavier loaf. When rye flour is combined with a considerable amount of white flour, the loaf is lighter. Rye flour is often used to make the crisp types of bread.

The other grain flours do not contain enough gluten to produce ordinary bread.

When bread is toasted, some 15 to 20 percent of its thiamin is destroyed. The darker the toast, the more thiamin has been lost. Obviously, zwieback or melba toast would be low in thiamin. Since both of these products are also very dry, their calorie count is not particularly low. A piece of melba toast, for instance, would provide as many calories as a piece of ordinary toast, which is one third larger.

TYPES OF BREAD

Enriched White Bread – In making enriched white bread only enriched white flour may be used, to which two percent of dried skim milk must be added. The latter not only improves the food value of the bread, but it gives the loaf a lighter texture.

Whole Wheat Bread – At least 60 percent of the flour used for making a loaf sold as whole wheat bread must be whole wheat flour. The remaining 40 percent is almost always enriched white flour.

Consumers can also buy 100-percent whole wheat bread. It is a firmer loaf of smaller volume for the same weight than is the 60-percent whole wheat or the enriched white bread. This is because whole wheat flour does not rise as well as does white flour.

Brown Bread – A loaf labelled as brown bread may be made entirely of white flour that is almost always enriched. It may be colored with molasses and/or caramel or it may contain some, but always less than 60 percent, whole wheat flour. Molasses is a bi-product of cane sugar-making and caramel is made by heating white sugar; neither is a dye. On the label, the baker must state which of these three substances provides the brown color.

Raisin Bread – A product marketed as raisin bread must contain not less than 50 parts of raisins or of raisins and currants for each 100 parts of flour. If bakers use both fruits, 70 percent of the fruit mixture must be raisins. This standard applies only to bread labelled as raisin bread. If bakers label a bread product fruit bread, for example, they may use their own recipes.

Non-standardized Bread – The food value of dark rye flour is very high. It contains somewhat more thiamin, riboflavin, and iron than whole wheat flour. It is also the highest in protein content, 16 percent, of all the flours. Thirty-three percent rye bread is rye and enriched white flour, a combination designed to produce a lighter loaf.

Oatmeal bread is similarly made partly of oats, which are high in both thiamin and iron, and partly of enriched white flour.

Hovis flour contains about 22 percent wheat germ and its use produces a loaf that closely resembles whole wheat bread in food value.

Pasta

Macaroni, spaghetti, and other pasta products, are made from a kind of flour that contains a higher percentage of gluten than regular white flour. This pasta flour is made from a special kind of wheat called

Pasta is the Italian word for 'paste.'

durum. When durum flour is moistened with water, it forms a sticky paste. This paste can be pressed or forced into various shapes and then dried. The sticky nature of the durum flour also allows pasta products to keep their original shapes when boiled.

COOKING PASTA

The degree of retention of the added vitamins and iron in the enriched types of pasta depends on the method of cooking used. If using a heavy pot with a tight lid, one should use twice as much water as pasta. To prevent scorching, the heat should be lowered when the pasta starts to cook. Actually, the pasta is being steamed and there will be very little or no water left by the time it is done. In this way, practically all the extra vitamins and iron will be retained.

Two-thirds of a cup of pasta cooked this way provide as much thiamin, riboflavin, niacin, and iron, as two slices of enriched white bread.

Pasta products are white or slightly cream-colored because they do not contain the germ and bran of the wheat. Most of the enriched pasta products are labelled 'vitamins added' and all of them list the specific additions. They are somewhat more expensive than the ordinary types of pasta. This extra cost, however, is justified if pasta is used as a basic foodstuff in meals.

Some Canadian companies are now producing pasta products enriched with thiamin, riboflavin, niacin, and iron to compensate for the low levels present in pasta or durum flour. Some leave out the iron.

Pastas made of soy flour are also worth extra expense as their food value is high.

Noodles labelled as egg noodles contain some egg in the paste which does improve the food value but probably not as much as enrichment would.

In Canada, the minimum amount of egg that must be added to egg noodles is also controlled by Food and Drug regulation.

Pastinas, special pasta products which are already cut into small pieces, are sometimes used as baby food. These pastinas are lower in both iron and the B vitamins than the baby cereals. Pastinas currently on the market have not had B vitamins or iron added to them although one variety has been enriched with 4 percent of dried egg yolk. Special baby cereals prove to be more effective in guarding babies from anaemia than the expensive pastinas.

Cereals

BABY CEREALS

All the special baby cereals are heavily fortified with the three main B vitamins and iron. The iron in them is especially valuable to a baby since milk is low in this mineral and since the supply of iron with which a baby is born is nearly exhausted by three months of age. When compared with the bottled strained meats, egg yolks, vegetables, and fruits, the baby cereals are not only much richer in iron per serving but also more economical in price.

The first of these special baby cereals, Pablum, was invented at The Hospital for Sick Children, in Toronto by two paediatricians, Dr. Tisdall and Dr. Drake.

COOK-AT-HOME CEREALS

Porridges – There are two types of cook-at-home porridges, the white refined types, and the dark whole grain ones which include rolled oats and rolled or cracked wheat. The whole grain types are much higher in thiamin and iron than the refined, unenriched ones.

All cook-at-home porridges are treated very gently during their factory processing and are meant to be cooked in the home at the temperature of boiling water. In this way, their natural thiamin is reduced only slightly.

White and Yellow Refined Cereals — As their color would indicate, the ordinary white wheat cereals, sometimes labelled as semolina, farina, or white wheatlets, are much lower in the B vitamins and iron than are the dark whole grain types. One type has had considerable iron added and even some wheat germ, 3 percent, but its white color still indicates its low thiamin content. Cornmeal, a yellow refined cereal, contains a modest amount of thiamin but little iron.

The thiamin value of these refined cereals can be increased by the addition of wheat germ.

Rolled Oats – The least expensive and most nutritious of all the common home-cooked cereals are rolled oats. Those packaged in plastic or paper bags distributed by some of the smaller, less well-known companies, are often the best buy.

If the oat kernels have been cut before they are rolled, they cook more quickly; hence, they are called quick-cooking oats. Instant rolled oats are more expensive although equally nutritious.

Rolled or Cracked Wheat – Rolled wheat (uncooked wheat flakes) is not quite as rich in thiamin and iron as rolled oats, but it is still very good and is also inexpensive.

Cracked wheat is another good alternative but takes much longer to cook.

Other Dark Cereal Mixtures – Some dark cereal mixtures contain wheat germ or soy grits – ground-up soybeans, both of which add extra B vitamins and iron. Recent tests have shown that the dark cereal mixtures sold in health food stores are more expensive than those sold in ordinary stores and are not superior nutritionally. Often, these health food mixtures have been supplemented with sesame seeds, dried coconut, oil, honey, and nuts which increase their calorie counts 50 percent.

THIAMIN AND IRON IN 3/4 CUP COOK-AT-HOME PORRIDGE

READY-TO-EAT CEREALS

During processing, the ready-to-eat cereals are subjected to a great deal of heat and other rough handling. As a result, much or even all of their thiamin may be destroyed and the food value of some of their proteins is also reduced. When whole wheat, for example, is shredded and toasted in the making of shredded wheat products, half the wheat's original thiamin is destroyed. A similar loss occurs in the processing and toasting of wheat flakes or bran flakes. Puffing a cereal completely destroys all its thiamin. Fortunately, the iron in cereals survives even the harshest treatment.

EFFECT OF PUFFING ON THIAMIN AND IRON IN ONE SERVING

0.1 MG IS 1/10 OF YOUR DAILY QUOTA OF THIAMIN

Many ready-to-eat cereals are now fortified with generous amounts of thiamin, riboflavin, niacin, and iron. In a few, not all of these have been added. The thiamin is sprayed on the cereal at the end of the processing when it will not be damaged. If the cereal has been fortified, this is stated on the label.

The labels on the ready-to-eat cereals also reveal what the cereals are made of; their ingredients are listed in descending order of their proportions. If sugar is listed first, that particular cereal contains more of it than anything else. Sugar is a poor food; it lacks proteins, fats, vitamins, and minerals and is high in calories.

One ounce, uncooked, of a cook-at-home cereal swells in cooking to make an average-sized serving; one ounce of most ready-to-eat cereals is also a suitable serving. If their costs are compared, the cook-at-home types are the least expensive of the two.

Canadian ready-to-eat cereals are more strongly fortified with the three main B vitamins than are the same cereals produced in the United States.

1. Answer true or false and give reasons for your answer.
   a) Toasted bread has fewer calories than untoasted bread.
   b) The proteins in milk are of better quality than those in cereals.
   c) Bread sold as brown bread is the same as that sold as whole wheat bread.
   d) All white flour is enriched.
   e) Any kind of home-cooked porridge is nutritious.
   f) Wheat germ is rich in thiamin and iron and is inexpensive.
   g) The ready-to-eat cereals that are highly fortified with iron are especially useful to adolescents and are low in calories.
2. Discuss the reasons why grain foods form the foundation of most people's meals all over the world.
3. Explain why it is good meal planning to eat food of animal origin at the same time as grain foods.
4. What are extenders in meat recipes? Name five different types of extenders.
5. Discuss why white flour is so popular in many countries. What happens to the three main B vitamins and iron in wheat kernels when they are converted into white flour? Discuss whether the enrichment of white flour should be compulsory as it is in the United Kingdom and in many states in the U.S.A.
6. Make a diagram of a wheat kernel showing its four main parts and listing the main nutrients in each part.
7. Consult an encyclopaedia and write a short sketch of the history of the manufacture of white flour in the United Kingdom from the time of the Roman Empire to the present. Include the types of mills used.
8. What are pasta products? What kind of flour is used in making them commercially? Why are some types of these products more nutritious than others? How can you cook them to conserve the maximum amount of their food value?
9. Describe the four main types of rice available in Canada and compare their nutritive value and price per ounce uncooked. How does canned rice pudding compare in price with that made at home?
10. Compare the cost per ounce of the cheapest brand of quick-cooking rolled oats sold in a plastic bag with that of a nationally advertised brand sold in a box. Price several of the white and yellow, finely granular, cook-at-home cereals per ounce. Name a number of whole grain cook-at-home cereals and compare the nutritive value of rolled wheat with that of white farina or semolina. How much harm is done to thiamin when you cook porridge?
11. Collect the labels of all the ready-to-eat cereals used in your home. Cut out the part that describes what is in them and also the one that lists their content of B vitamins and iron, if they have been fortified. One ounce is the usual serving of such cereals. Discuss what you have learned from the labels. The thiamin and iron will probably be listed as so many milligrams per 100 grams or per $3\frac{1}{2}$ ounces.

6 Meat, Poultry, and Fish

Meat, poultry, and fish, are, unfortunately, the most expensive foods. Farmers can raise far more 'calories' per acre in grain than, for example, in the form of beef. In other words, cattle, pigs, and poultry eat many more calories in their feed than they produce in meat. The processing of meat, poultry, and fish is also relatively expensive.

Despite their cost, it is still a good idea to eat more than one serving per day of meat, poultry, or fish if they are available. These foods are grouped together because they share many similarities though they differ in the amounts they contain of specific nutrients.

"Cattle and hogs are the two major species raised for meat in Canada. In 1970, Alberta had the highest number of beef cattle, followed by Ontario, Saskatchewan, Manitoba and Quebec. Ontario had the largest number of hogs, followed by Alberta, Quebec, Saskatchewan and Manitoba."

"Poultry meat production in 1970 (1,035 million pounds) was in excess of domestic disappearance (958 million pounds). Over half the poultry in Canada in 1970 was raised in Ontario and Quebec."

Canada's Food Guide *recommends "one serving of meat, fish or poultry" every day and that one should "eat liver occasionally."*

The lean parts of meat, poultry, and fish provide:

- ☐ *generous amounts of animal proteins*
- ☐ *considerable iron, thiamin, and riboflavin*
- ☐ *in some cases, vitamin A*
- ☐ *varying amounts of fat*

NUTRIENT CONTENT OF MEAT, POULTRY, AND FISH

Proteins in Meat, Poultry, and Fish

At least one-quarter of the daily protein quota is filled by one generous serving, about four ounces raw or three ounces cooked, of any of these foods. Their proteins contain all of the essential amino acids. In fact, they contain so many of them that they can lend some to the incomplete plant proteins that are eaten at the same time. These proteins are present only in the lean parts of meat, poultry, or fish; they are not found in the fat.

Iron in Meat, Poultry, and Fish

Variety meats are particularly good sources of iron. Any kind of liver – pork, lamb, calf, beef, or poultry, is very rich in iron. Kidney and heart are also higher in iron than the usual meats, which are largely made of muscle tissue. The variety meats include liver, kidney, and heart.

A good serving of relatively lean 'muscle' meats – beef, pork, lamb, or veal, has about 2.5 mg of iron; wieners and poultry are a little lower, fish lower still, but all are still among the best foods for iron.

THE IRON IN LIVER

TYPE	mg OF IRON PER SERVING
Pork Liver	25
Lamb Liver	15
Calves' Liver	12
Beef Liver	7.5
Poultry Liver	7

At least 12 mg each day is recommended for adolescents.

Adolescent girls need a great deal of iron, not only to replace the iron lost in menstrual periods, but also because they are still growing. Boys of the same age need just as much iron because they are usually growing even more rapidly than girls, and because everyone, male or female, loses a certain amount of iron from the body each day.

OBTAINING 12 mg OR MORE OF IRON PER DAY

SAMPLE DAILY MENU ONE	IRON IN mg	SAMPLE DAILY MENU TWO	IRON IN mg
1 serving beef liver	7.5	*1 serving lean muscle meat*	2.5
3 slices enriched white bread	2.1	*Iron-fortified ready-to-eat cereal*	4.0 or 6.0
3 servings vegetables (average of many)	2.4	*3 slices enriched white bread*	2.1
3 servings fruit (average of many)	1.2	*3 servings vegetables*	2.4
		3 servings fruit	1.2
TOTAL	13.2	TOTAL	12.2 or 14.2

The Canadian experts maintain that all adolescents should obtain at least 12 milligrams of iron each day in their food; the American authorities recommend 18 milligrams.

Thiamin in Meat, Poultry, and Fish

All kinds of meat, poultry, and fish add some thiamin to meals and snacks, though fresh pork definitely contains the most thiamin. Even when pork is cured to make ham or bacon, and nearly half of its thiamin is destroyed, it is still a remarkably rich source of thiamin. The manufacturers of canned pork luncheon meat and sausages, for the sake of safety, have heated them at a high temperature for a considerable length of time. As a result, even though at least half of their thiamin is destroyed, they still are good thiamin sources. While pork weiners and pork bologna have less thiamin value, they, too, are worth using for this vitamin.

The second best types of meat for thiamin are the variety meats: heart, kidney, and liver.

The other common types of meat are next highest in thiamin value, lamb and veal being higher in thiamin than beef and poultry. Fish, next lowest, are still quite good sources of this vitamin.

All body cells require the help of thiamin to obtain the energy they need from the simple substances derived from food brought to them by the bloodstream.

Pork should always be cooked until it no longer looks pink.

FOODS CONTAINING THIAMIN
(mg PER SERVING)

	VERY HIGH	HIGH	GOOD	FAIR
Lean Fresh Pork	0.78			
Ham		0.46		
Variety Meats (average)		0.40		
Wieners (2)			0.16	
Lamb and Veal			0.13	
Beef (hamburg)			0.07	
Poultry			0.07	
Fish				0.05

If multiplied by 100, these figures will indicate the percentage of the daily quota of thiamin each food will provide.

The experts recommend that adolescents eat a small but important amount, about one milligram, of thiamin in their food daily. Even the best of meat, fish, or poultry does not provide that amount in one serving. As thiamin cannot be stored in the body, enough of it must be eaten every day.

SAVING THIAMIN IN MEAT, POULTRY, AND FISH

In cooking

To save as much as possible of this vitamin in roasted meats, whether the roast is of pork or of any other meat, the oven should be set at a relatively low heat, 325° to 350° Fahrenheit. This setting will mean a longer roasting time, but the roast will shrink less. Reduced shrinkage, of course, means more servings per roast.

More thiamin is saved, and the meat is more tender, when chops, for instance, are browned quickly, rather than panfried on top of the stove, and then finished in a 325° Fahrenheit oven for fifteen minutes.

The very fast microwave type of cooking is also effective in thiamin retention.

Riboflavin in Meat, Poultry, and Fish

The trio of common variety meats – liver, kidney, and heart, is especially high in riboflavin. All the other types of meat, poultry, and fish are also quite good sources.

Fortunately, riboflavin can withstand heat without harm.

Other Vitamins and Minerals in Meat, Poultry, and Fish

The 'muscle' meats do not have any vitamin A. Liver, a variety meat, in contrast, is enormously rich in it; kidney, also a variety meat, is the next best source. Small amounts of vitamin A are in all of the 'fat' sea fish, which include salmon, tuna, sardines, mackerel, and herring. Some iodine is also present in the sea fish, a serving of which, fresh, frozen, or canned, also contains at least 300 I.U. of vitamin D.

Fat in Meat

Nutritionally, the fat in meat is its least valuable constituent. Ounce for ounce, meat with fat provides a little more than twice the calories of the same meat, lean. The number of calories obtained from meat can thus be reduced by choosing relatively lean cuts and by not eating any visible fat. The calorie count of beef cuts can be lessened in this way by about 50 percent.

For the weight-conscious, one of the best cooking methods is broiling or roasting meat on a perforated broiling pan or rack which allows the fat to drip through. For dieters, a lower calorie substitute for gravy is the juice, often called pan-gravy, that escapes from the meat when it is carved. Cooking a stew and refrigerating it unthickened allows you to skim off the fat – so reducing its calorie count.

LIVER

Liver is an excellent source of nearly all the nutrients. It even contains a little vitamin D, about 50 I.U. per serving, and some vitamin C, about 30 mg per serving. Liver is also the outstanding food source of vitamin B_{12} and of some of the other less well-known B vitamins.

LIVER — THE SUPER FOOD

ONE SERVING	VERY HIGH	HIGH	LOW
protein			
iron			
thiamin			
riboflavin			
vitamin A			
vitamin C			
vitamin D			
vitamin B_{12}			

A few people, nearly always adults, develop an unusual type of anaemia called pernicious anaemia because they cannot absorb vitamin B_{12} from their food. Before the chemists produced this vitamin in pure form, the pernicious anaemia of these patients was kept under control by feeding them liver each day. Today, periodic injections of pure vitamin B_{12} would be administered.

GRADING MEAT, POULTRY, AND FISH

Meat

Many municipalities do not allow uninspected meat to be sold within their limits. Various health departments inspect the packing houses, canning factories, and all other food-producng establishments in their area to ensure standards of cleanliness and proper sanitation.

Graders examine a beef carcass, for example, to determine its maturity, quality, and meat yield. The older the animal, the less likely it is to yield tender cuts. Graders can judge its maturity by the degree of hardening of the cartilage. They check the quality by the color, texture, and firmness of the fat and lean. The most important new step in grading is the actual measurement of the thickness of the overlying fat at the level of the eleventh rib. The width of this fat layer accurately indicates how much lean meat the carcass will provide. A heavier carcass of the same grade and class will have a wider layer of fat than a lighter one of the same grade and class. By means of the above observations and measurements, the beef is assigned grades.

Poultry is also graded according to Canada Department of Agriculture standards. The highest grade, 'Canada Grade Special,' usually carries a purple metal tag attached to the breast of the bird. The grade may also be shown on the tag attached to the freezer bag. This grade of poultry is not common in Canadian stores. 'Canada Grade A' birds, carrying a red tag, are of the grade seen most often. The differences between 'Canada Grade A' and 'Canada Grade Special' are slight. 'Canada Grade B' birds carry a blue tag and they too are quite satisfactory, although their appearance is not as good as that of the two higher grades.

In isolated areas where the slaughtering is done by a local butcher or farmer, such meat can be safely used provided it is thoroughly cooked.

The Food Directorate of the Health Protection Branch has passed many regulations regarding meat. Certain parts of the carcass may not be sold for human use. Minced beef may not contain more than 30 percent fat; if it is sold as lean minced beef, the upper limit of fat is only 15 percent. The amount of filler, such as grain or potato meal, that may be added to certain meat products is limited and only some 'curing' salts in specified amounts may be used in such products as corn beef.

In September of 1972, new standards for grading beef in Canada came into force. This new method was introduced to help packers, wholesalers, retailers, and purchasers to obtain exactly the type of beef they want.

'Canada grade A' is ribbon-banded with red ink, 'B' with blue, 'C' with brown, and 'D' and 'E' with black. Grade 'C' is seldom sold in retail stores; it and the lower grades are mainly used for further processing. Grades 'A' and 'B' are further divided into classes 1, 2, 3, and 4. Class 1 has the narrowest width of fat allowed and class 4 the widest for the grade. Thus, the finest type of lean beef would be 'A1'.

All meat processed by large packing plants in Canada is carefully examined by a veterinary inspector employed by the Canada Department of Agriculture. If the carcasses are satisfactory, the large wholesale cuts are stamped 'Canada Approved.' After the butcher has divided and trimmed the meat into retail-size cuts, this stamp is usually not visible.

Canned meat, poultry, and fish

The labels on canned meat, poultry and fish state that they all have been inspected and approved and also list their ingredients, in the order of prevalence, so that consumers will know whether broth, gelatine, vegetables, spices, or other substances have been added.

Meat, poultry, and fish canning factories are also inspected by government inspectors and the statement "Canada Approved" is found on their labels if the foodstuffs are produced in this country. If the canned meat is imported – from Paraguay, for example, on the label will be a statement to the effect that the meat has been inspected and passed by the Paraguay Department of Agriculture.

SAVING FOOD DOLLARS

Meat

By choice of cut – Except for calves' liver, all the other variety meats are inexpensive. Being boneless and low in fat, they are good bargains.

The parts of beef or pork carcasses that are less tender include those muscle areas the animal has used more vigorously than other parts. These tougher cuts are considerably less expensive than the tender ones, and have the same food value, besides.

By choice of cooking method – Tougher, less expensive cuts of meat may be minced, as in hamburg, tenderized with a meat tenderizer, or cooked slowly using moist heat. Pot roasts, stews, and casseroles are common methods of moist-heat cooking.

In Canada, the soya protein and beef mixture has been approved by the Food Directorate. Simulated 'meat' products made of soybeans will soon be on the market. Regulations will require their labels to list all of their ingredients.

By use of extenders – The number of servings per ounce of meat can be increased by the use of 'extenders.' Extenders include vegetables or spaghetti in stew, toast points or dumplings, crusts on meat pies, and bread crumbs, rolled oats, or wheat germ in meat patties or meat loaves. As an extender, one-half to one cup of skim milk powder may be added to a two-pound meat loaf recipe, for instance, without altering its flavor or appearance. The extender used in the economical ground beef-and-soya burger is soya protein, made from soybeans. The soya is an almost complete protein but it does not contain as much of the B vitamins and iron as does meat.

"Soybeans are grown in Ontario. In Canada the acreage for soybeans has been limited by climatic conditions but production increased from an average of 7.4 million bushels in 1963-67 to 10.4 million bushels in 1970."

Poultry

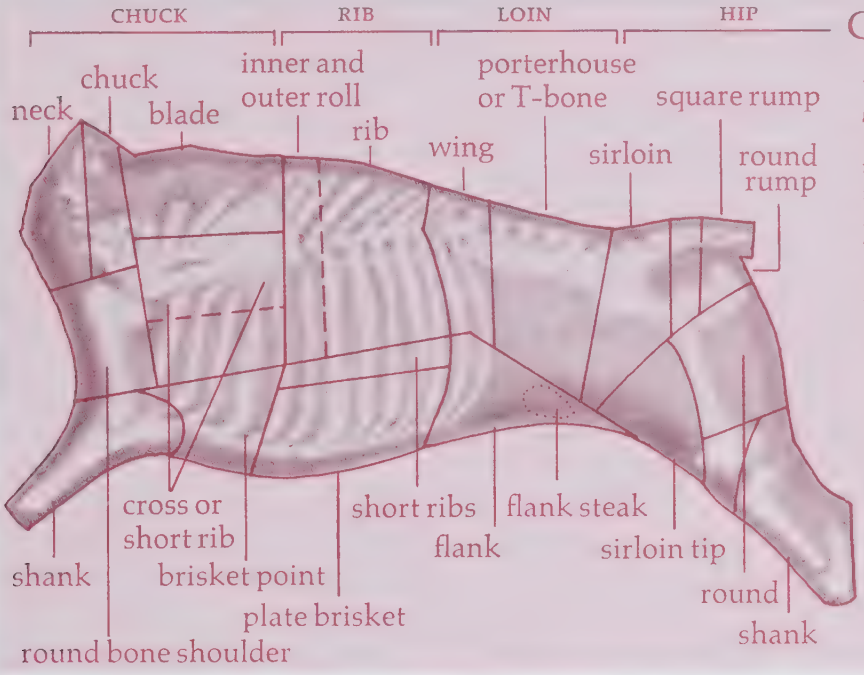
Poultry is much less expensive now than it was in the 1940s, partly because the poultry raisers have developed methods to make the birds grow more quickly for the same amount of feed and partly because they have developed 'meatier' types of poultry. Poultry is usually a very good buy. If the usual oven-ready whole bird is chosen, the cost to the consumer of the edible parts of the bird is about one-third more per pound than the actual store purchase price paid. Adding the one-third allows for the waste in the bones. With this cost addition, its price can be compared to that of boneless meat.

Most poultry is sold 'oven-ready,' with the giblets enclosed in a small grease-proof bag inside the bird. Very often, the birds are frozen in a freezer bag.

Unless it is to be cooked immediately, poultry – whether a whole bird or pieces, must be kept frozen until it is to be thawed for use. The dressing should not be placed in it until just before it is to go into the oven. Any leftovers from the meal should be refrigerated promptly, even if they have not cooled entirely. It is even safer to remove the dressing and refrigerate it separately.

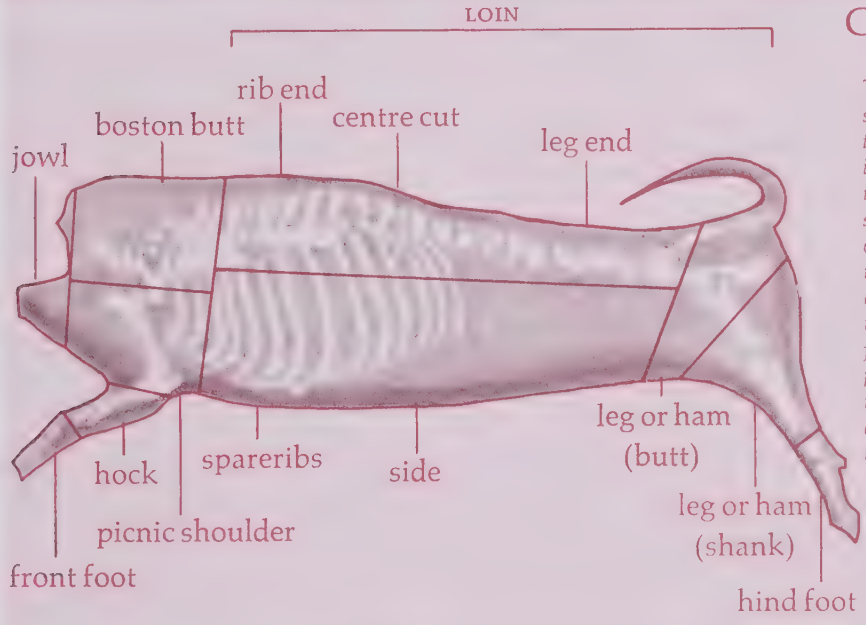
Fish

The cheapest types of fish are often less expensive than any type of meat, except possibly hamburg or poultry. Appearance is a cost factor in buying canned fish Dark red salmon, for instance, costs more than the paler varieties; solid, white tuna is more expensive than flaked, pinkish tuna.



CUTS OF BEEF

The most tender and choicest cuts of meat come from the parts of the animal that are least exercised — in other words, along the centre back. In beef, the tender retail cuts are porterhouse roast, porterhouse or T-bone steaks, wing steaks, prime rib roasts, and sirloin steaks and roasts. The undercut, or tenderloin, is a strip of muscle that lies underneath the T-bones in a porterhouse roast or a T-bone steak. It may be sold separately as beef tenderloin or filet. This is the tenderest of all beef cuts; it is expensive but, as it contains no bones or excess fat, there is no waste.



CUTS OF PORK

This same undercut from a hog may be sold as pork tenderloin. It, too, is very tender. The farther away a cut of meat is from this back section, the less tender it will be. As the back section is small in relation to the rest of the carcass, there are always more of the less tender, and less expensive, cuts. When buying meat, one should consider, too, the cost per pound for bone and for the actual meat. Any cut of meat provides much the same nutrients, but the less tender cuts require more time and care in preparation and cooking to make them appetizing.

MEAT SUBSTITUTES

In comparing the meat substitutes – eggs, cheese, dried beans or peas, to meat in food value and cost, the most important nutrients to consider are protein, iron, and thiamin. Meat is a particularly good source of these nutrients. It would take three large eggs to match a hamburger in protein, iron, and thiamin. The difference in price between the two would usually be slightly in favor of the eggs. However, most people would not eat three eggs at one meal and, in any case, such lavish use of eggs is probably unwise from a health point of view, considering cholesterol levels.

A cupful of canned beans, another meat alternative, however, will probably be just as expensive as a hamburger. Yet, dried beans soaked overnight in water, cooked preferably in a pressure cooker to save time, seasoned, and finished in a variety of ways, will be cheaper than meat. A cupful of cooked dried beans, in beans with pork, or beans with tomato sauce, has two-thirds as much protein as a hamburger with even more iron and thiamin. Thick lentil, split pea, or bean soups and casseroles featuring dried lima or pea beans, are other nutritious and inexpensive meat alternates.

Cheese, of course, is a good source of protein, but is very low in both iron and thiamin. Besides, even a large serving of cheese weighs considerably less than a serving of meat, fish, or poultry. Adding some cheese to a meatless meal, though, is a good idea.

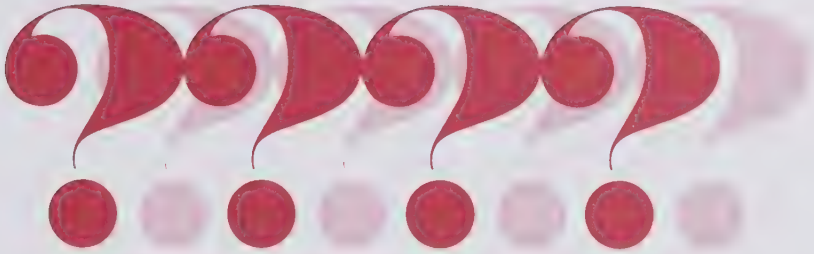
Canada's Food Guide suggests that, "Eggs, cheese, dried beans or peas may be used in place of meat."

VEGETARIAN DIETS

It is difficult to plan a purely vegetarian diet that will supply all the nutrients needed, especially by growing individuals and expectant mothers. Except for soybeans and nuts, the vegetables with the highest protein content – the cooked dried legumes, are only about 6 percent protein. Besides, most of the plant proteins are deficient or are very low in one or more of the essential amino acids. A well-planned vegetarian diet must then include large amounts of a great variety of grain foods, nuts, legumes, other vegetables, and fruits, since the protein concentration of these foods is, for the most part, low.

Some people follow lacto-ovo-vegetarian diets. This means that they use milk (lacto) and eggs (ovo) as well as foods of plant origin. By including milk and eggs in their diets, these individuals have less of a problem than strict vegetarians in planning meals and snacks that will provide enough of all the essential nutrients.

Most restricted diets do not contain all the foods that are needed for good health and growth. Following a restricted or unusual diet is dangerous to one's health, unless the diet has been planned by a nutritionist or a physician.



1. Answer true or false and give reasons for your answer.
   a) Fat meat gives you as much protein as does lean meat.
   b) The less tender cuts of meat are less expensive but just as nutritious as the more costly.
   c) Extenders make the meat go further.
   d) The proteins in meat, poultry, and fish are complete.
   e) Fresh pork is the meat richest in thiamin.
   f) Meat tenderizers are harmless and useful.
2. Describe several methods for tenderizing meat. What are meat tenderizers made of and how do they work? Are meats that have been tenderized at packing plants still available in retail markets? If so, are they satisfactory?
3. Explain why pigs eat many more calories in the form of corn and other food than they produce as calories in pork.
4. Demonstrate how to cook liver so that a person who does not eat liver might enjoy its taste.
5. Find out why pork should always be cooked thoroughly.
6. What would you look for in choosing: (a) a prime rib roast of beef and, (b) a pot roast of beef?
7. Why are you warned not to put the dressing in poultry until just before roasting it? Why is it wise to refrigerate the poultry as soon as possible after it comes back to the kitchen after a meal?
8. There is a common belief that meat must be red in order to be an excellent source of iron. Explain why this is not true.
9. What is meant by the aging of beef? How is it done and what effect does it have? Would the butcher know whether the beef he sells you has been aged?
10. Visit a specialty store with a wide selection of dried beans and peas. Discover some recipes for using them.

7 Eggs

CHOOSING AND STORING EGGS

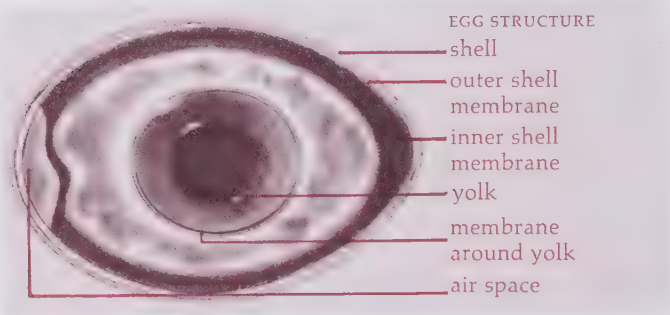
When pullets or young hens begin to lay, their eggs are smaller than those of mature hens. Various sizes of eggs are, then, often found in stores.

EGG SIZE AND WEIGHT

SIZE	WEIGHT PER DOZEN
Extra large	27 oz. or over
Large	24 oz. or over
Medium	Over 21, but under 24 oz.
Small	Over 18, but under 21 oz.
Peewee	Less than 18 oz.

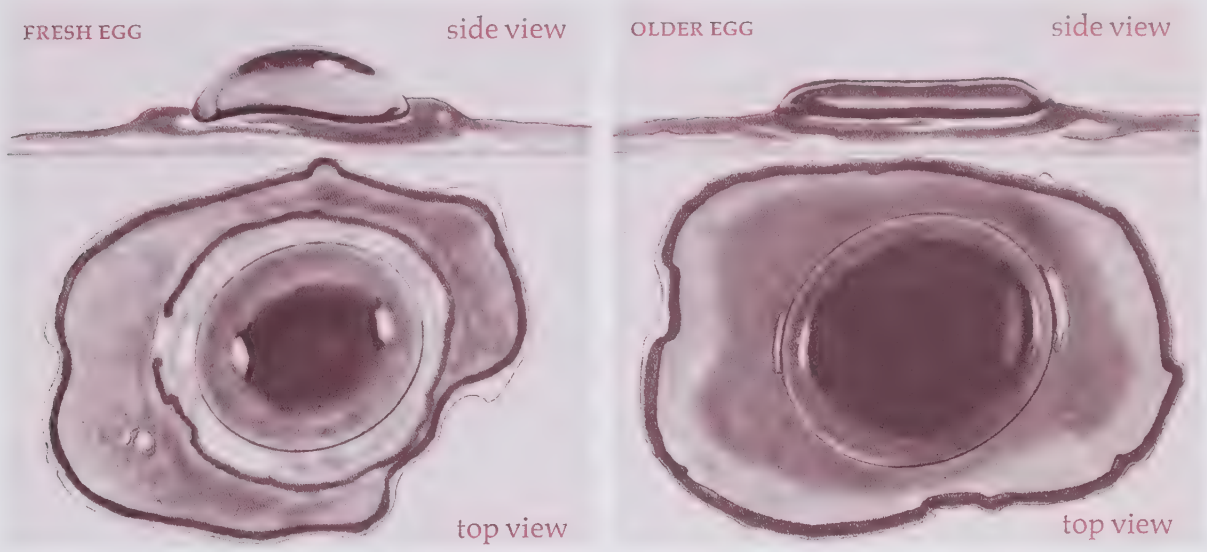
Whether small eggs are economical or not depends on what use is planned for them. For general baking, when using a leavener such as baking powder, small eggs can be substituted for large ones without any adjustment in the recipe. If eggs are being used as thickeners for a custard, more of the smaller eggs will have to be used. As the same situation occurs when a main egg dish is planned, it may be a false economy to buy small eggs instead of large or medium ones, unless there is a wide difference in their prices.

The shell of a fresh egg of any size is dull-looking because it is covered by a thin protective layer called the 'bloom.' If, by chance, there is a little dirt on the shell, it can be rubbed off with a dry cloth. If the egg is washed, this protective bloom is removed and the egg will not keep well. Beneath the shell are two membranes called the outer and inner shell membranes. At the thick end of a fresh egg, there is a small airspace between these two membranes. Another thin membrane surrounds the yolk.



When an egg deteriorates in quality, which happens quite soon if it is not kept cold, some of the water in the egg changes to water vapor and escapes through the shell membranes and the shell. As a result, the fluid contents of the egg become smaller and, therefore, the airspace becomes larger. Also, some of the water in the white of the egg moves into the yolk which becomes larger and stretches the membrane around it. When such an egg is cracked open, the yolk may break, preventing its separation from the white. This can be troublesome since, if the white has some yolk mixed with it, the white will not beat up stiffly.

On a modern poultry farm, the eggs are gathered and placed in refrigeration as quickly as possible since eggs lose rapidly in quality unless kept at a temperature between 45° and 55° Fahrenheit. One day at room temperature will damage eggs as much as a week in the refrigerator. Thus, eggs need to be kept cold in their entire journey from producer to consumer.



When a fresh egg of good quality is broken onto a plate, the yolk stands up well and is surrounded by a circle of thick white. A less fresh egg has a wider, flatter yolk, a thinner white, and such an egg spreads over a wider area.

GRADING EGGS

The degree of freshness of an egg cannot be detected from external examination. Fortunately, this can be done by CANDLING. In brief, this means holding the egg in front of a bright light shining through an opening about the size of a fifty-cent piece. Originally, a candle provided the light, hence the name, candling. When an egg is rotated in front of the light, the candler can see the size of the air space and the size, position, and movement of the yolk. From these observations, its freshness and its grade can be determined. Machines which enable a trained grader to grade eggs rapidly are now in general use.

Whether the shell of an egg is brown, cream, white, or speckled depends on the breed of the hen and bears no relation to an egg's quality or food value.

All eggs displayed for sale in Canada must be graded.

Most often, consumers are only able to buy 'Grade A1' or 'Grade A' eggs. 'Grade A1' eggs are marketed only by well-equipped and expert producers who have special permits from the Canada Department of Agriculture. Sold at a premium price, these eggs are the finest in quality, but are not often available in retail outlets. 'Grade A' eggs are also excellent and are suitable for all purposes. While there are three lower grades – 'B,' 'C,' and 'C cracks,' which can be used for cooking and baking, these grades are not often seen in stores.

Small brown or red spots inside an egg are quite harmless; these spots are actually more difficult to detect in candling 'grade A1' or 'grade A' eggs, in which the white is thicker than it is in eggs of lower grades.

NUTRIENT CONTENT OF EGGS

ONE BOILED OR POACHED EGG	
NUTRIENT	% OF DAILY QUOTA
vitamin A	20
riboflavin	13
iron	10
protein	8
thiamin	5
calories	4

Since an egg contains everything necessary for the growth of the tiny fertilized cell in it into a young chicken, it is not surprising that it is good nourishment. In fact, eggs provide valuable amounts of all the vitamins but vitamin C, which a chicken can make for itself. Eggs are short of carbohydrate which, in animals, is largely used as a source of energy for muscular movement. Unborn chicks get most of their energy from the fat in the yolk.

The white makes up about two-thirds of an egg; the yolk, in which most of the food value is concentrated, the remaining third. The white is nearly 90 percent water in which is dissolved about half the whole egg's protein and riboflavin. The rest of the protein, riboflavin, and all of the vitamin A, thiamin, and iron are in the yolk. The calorie contribution of a large egg is low, only about 80 calories when cooked in water; frying adds about 30 more calories. In relatively low calorie form, then, one egg provides significant amounts of five nutrients.

Proteins and Fat in Eggs

About 70 percent of the calories of a boiled or poached egg come from the fat naturally present in it. The rest of its calories comes from its proteins. These are complete proteins, the kind used for both growth and body maintenance. Egg proteins can compensate for the deficiencies of the incomplete proteins in flour and other foods of plant origin. Thus, the eggs added to a cake mix make complete the incomplete proteins in the flour. The fat in the egg also compensates for the low fat content of flours and other cereal products. By adding eggs, then, the food value of any recipe may be improved.

Iron in Eggs

One egg, weighing about two ounces, contains one-tenth the daily quota of iron. Adolescents, in particular, need sufficient iron to keep their blood well supplied with haemoglobin, which in turn, supports body maintenance and energy.

Vitamin A in Eggs

The color of an egg yolk depends mostly on what the hens are fed. If hens receive dried greens in their food or if they are allowed to eat grasses, the yolks will be a dark yellow, due to the carotene the hens have eaten in the greens or grasses. If the hens are kept closely penned but receive fish oil in their rations, the yolks will still be as rich in this vitamin, but paler, because the fish oil supplies colorless vitamin A. Today, most poultry farms try to produce eggs that have light yellow-colored yolks.

Vitamin D in Eggs

Eggs contain variable amounts of vitamin D, ranging from 10 to 100 I.U. per egg. The amount depends on how much vitamin D the hens have received in their feed. Eggs are, thus, not a dependable source of this vitamin.

B vitamins in Eggs

An egg makes a sizeable contribution to the daily riboflavin quota, a lesser one to that of thiamin, and the least to that of niacin, the third common B vitamin.

COOKING WITH EGGS

Eggs are useful in cooking for four quite different reasons. They may serve as binders, thickeners, leavening agents, or emulsifiers, often in several of these ways at the same time.

Sometimes, there may be a dark ring around the yolk of a hard-cooked egg. This ring is formed partly from the iron in the yolk. Its formation may be reduced by cooking the eggs in water kept below the boiling point and by plunging the eggs into cold water as soon as they are cooked.

As binders

In many recipes, the rather sticky egg proteins help to bind together the other ingredients. When an egg is added to ground meat, bread crumbs, and seasonings in making a meat loaf, the egg helps to hold the mixture together, so that it may be moulded. When cooked, the egg proteins become stiff (coagulate) and help the meat loaf hold its shape. Similarly, when chops are dipped into a beaten egg and then rolled in bread crumbs, the egg makes the crumbs adhere to the chops. Frying the chops makes the egg an even more efficient binder.

As thickeners

In custard-making, egg proteins act as the thickener. For soft custards, moderate heat is used. If the temperature becomes too high or if the custard is cooked for too long a time, the custard will be curdled, lumpy, and watery. Both the thickening, which is desired, and the curdling, which is not, are the results of changes in the egg proteins.

As leavening agents

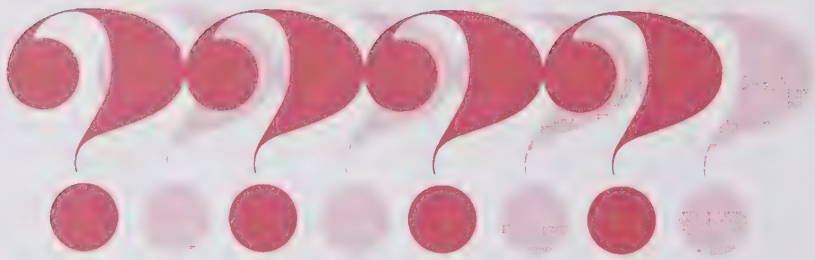
With the use of eggs, sponge cake can be made without baking powder. When egg whites are beaten, a great deal of air is mixed in with them. When a sponge cake is baked, the air among the strands of egg protein expands, and the cake rises. As the baking continues, the proteins become quite stiff, or, coagulate, and the cake does not fall. When baking powder is used, the beaten egg still helps in the leavening process.

The fluffiness of baked fruit whips, soufflés, and meringues is also due to the trapping of air among the mesh of the stretched and later solidified egg white proteins.

As emulsifiers

Eggs also contain a small amount of a complex, fat-like substance called lecithin. This substance acts as an emulsifier by helping to keep the fat evenly spread in small droplets throughout the food. The egg or egg yolk used in making mayonnaise has this effect.

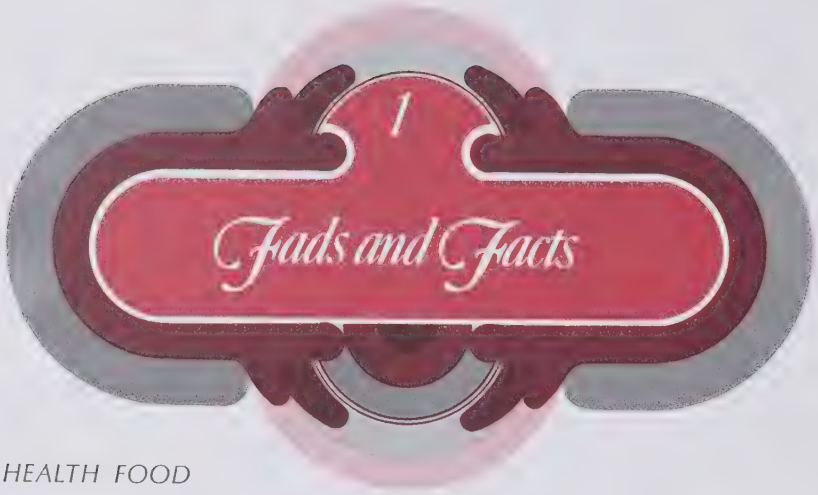
Lecithin is found in most of the cells in the human body; it can be made easily in the body from other substances. The small amounts of lecithin taken into the body in the form of food are broken down in the digestive tract and the fragments are absorbed. Some health food advocates are now recommending lecithin capsules as aids to better health. Their claim is that it is a natural tranquillizer and that it relieves sleeplessness, fatigue, irritability, and other nervous troubles. As there is no scientific evidence that lecithin has these effects, these capsules, costing $1^1/_2$ to $2^1/_2$ cents each, are not wise purchases.



1. Answer true or false and give reasons for your answer.
   a) The size of an egg is related to its grade.
   b) An egg that has a large flat yolk and a runny white is likely a fresh one.
   c) Eggs add food value to any recipe.
2. Describe the various nutrients that you obtain in one egg. How much larger is the white than the yolk and what nutrients does the white contain?
3. Explain the four different ways in which eggs are useful in cooking and give examples of each.
4. Cook a custard sauce until it curdles; estimate the temperature at which curdling occurred. Beat the curdled sauce with an egg beater; note any change in the texture of the sauce. Record your observations and conclusions.
5. Obtain current prices of 'Grade A' large, 'Grade A' medium, and 'Grade A' small eggs. Using these prices, compare the cost of making scrambled eggs for six persons if you used large eggs, medium eggs, and small eggs, making any necessary adjustments in the recipe.

Section 3

Meals



HEALTH FOOD

One of the reasons for the recent phenomenal growth of health food stores may be that more people are beginning to realize that their eating habits need improvement and that the kind of food they eat will affect their health. Most cities and large towns now have at least one such store; some even have health food restaurants. Some of the supermarkets and drugstores also have sections where health foods are displayed.

Public lectures, newspapers and popular magazines, and television and radio broadcasts often are forums for health food enthusiasts, introduced as 'nutrition experts.' Informed consumers who know how to choose their foods wisely should be able to decide whether or not authors of health food books and salesmen in the health food stores have any right to claim that the unusual foods which they promote and sell are, in fact, superior to those available in the usual food stores or if there is justification in condemning many ordinary foods.

Health food stores sell: (1) health food publications – catalogues, books, magazines; (2) some ordinary foods and many unusual ones; and, (3) many food supplements in the form of powders, tablets, capsules, and liquids.

Health Food Publications

CATALOGUES

Often, health food stores make available a catalogue listing the prices of their products, describing the benefits of regular use of them. Statements by 'authorities' in the field of nutrition are used to support claims of well-being due to new diets of health foods. The authorities cited are very seldom qualified nutritionists or physicians and, if a known expert is quoted, the statement made is often so out of context as to have its original meaning changed.

The use of many of the foods recommended in the catalogues is sometimes linked to remarkable cures. The effects of garlic, for example, a member of the onion family were described as follows: "For many months I was utterly exhausted, regardless of whether or not I exerted myself." The writer went on to say that doctors had found nothing wrong with his health, yet it was almost impossible for him to do his

✹ *"In spite of all that government and industry can do, the ultimate responsibility lies with the consumer. Consumers should make it their business to acquire reliable nutrition information and to selectively promote nutritious foods and reject foods that offer little nutrition. Consumers should not depend on government to spoon-feed them information nor should they be misled by excessive promotion of goods of questionable nutritional value. There is no substitute for a well-informed consumer."*

Food Poisoning Hits 70 Guests After Banquet

Vineland (CP)–Seventy members of the Kinsmen Club from near by . . . ville and their wives were treated in hospital Sunday for food poisoning following a club banquet in a . . . hotel Saturday night.

A hospital spokesman said all of the persons treated "had very serious abdominal cramps and some were vomiting."

The spokesman said most of the persons were treated with drugs and released Sunday but three others remained in hospital yesterday, in satisfactory condition.

. . ., a club member who arranged the banquet, said some food was brought by members and other food was purchased. Among items on the menu were lobster, roast beef and salad.

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regular work because of this great feeling of tiredness. A friend suggested garlic. Within three days the patient found a tremendous improvement in his stamina, so much so that he reported: "I was free of fatigue even after doing the hardest kind of physical work, and have so continued to this day. I take but one tablet [of garlic] each day."

Certainly such positive claims of better health would encourage some food shoppers to buy these miracle products from the health food catalogue, yet no such miracle foods actually do exist. However, if consumers believe the accounts they read, they might, temporarily, feel better because they believe they will. Mental outlook can have a great effect on how one feels. Unfortunately, if an individual's health is not good because he or she is suffering from the early stages of a serious disease, treatment with these 'wonder foods' could delay medical care until such time that full recovery would not be possible.

BOOKS

The authors of health food books are many and varied. They usually have no real knowledge of foods and nutrition, and little understanding of either health or disease.

Health food owners and salesmen themselves are often convinced that the books they sell are accurate, but they, themselves, lack the knowledge that would allow them to judge the accuracy. Moreover, these books recommend the kinds of foods they sell in their stores.

To determine the reliability of health food books, one can write or phone the Food Directorate of the Health Protection Branch, Department of National Health and Welfare in Ottawa, or the Nutrition Division of the provincial or local municipal Department of Health to ask their advice. Another source of information is the closest university, if it has a department where food courses are given.

Health Foods

If the prices of the common foods sold in ordinary stores are compared to those of similar foods available in health food stores, the latter are nearly always more expensive.

Most people enjoy many natural foods such as raw fruits and vegetables, but just being 'natural' does not make a food safe. The sprouts and the green-colored material on the outer layers of potatoes, for instance, that have been exposed to sunlight are mildly poisonous. Toadstools are natural foods but a few of them are very poisonous, as are the leaves of some plants, such as rhubarb.

Milk and Cheese – Some health food stores sell raw goat's milk, often labelled as pet food. This type of raw milk can be dangerous. The authors of many health food books claim that pasteurization of milk, that is, the heating of milk to 161° Fahrenheit for 15 seconds, followed by rapid cooling and then suitably cool storage, makes milk 'unnatural.' Pasteurization does reduce slightly milk's naturally small amount of vitamin C, but pasteurized milk is not used specifically as a source of vitamin C. Pasteurization, however, does effectively prevent the spread of several serious diseases.

In Ontario and Saskatchewan, it is illegal to sell unpasteurized cow's milk.

Although health food supporters condemn pasteurized milk, most health food stores sell buttermilk and yoghurt, both of which are made from pasteurized milk and which are considerably more 'unnatural' than pasteurized milk. The same stores often advertise unpasteurized cheddar cheese as a special commodity, not realizing that cheddar cheese is not pasteurized; it is rendered safe, as far as bacteria are concerned, by aging.

Eggs – Fertile eggs are also sold as health foods with the claim that they are more nutritious and 'natural' than the usual infertile eggs. Such eggs do not keep well, nor is there any scientific evidence to support a claim of nutritional superiority to ordinary infertile eggs. Health food stores also sell eggs laid by hens that have been allowed to run loose or by hens that have been fed 'organic' food. Neither of these practices actually improves the food value of the eggs.

Grains – Also recommended by health food books and sold by health food stores are whole grain products of various kinds such as whole wheat flour, stone-ground wheat flour, rye flour, and soya flour. These foods are all good but are not essential for health. One whole grain, millet, is recommended as a particularly nutritious grain. Actually, its best quality is that it can be grown in arid regions where the more popular grains such as wheat or rye cannot be raised. It is not an unusually nutritious grain.

Health food stores also sell expensive heavy dark loaves of whole grain bread. Such breads must be refrigerated and, even so, can soon go mouldy. Their high bran content may be upsetting to the digestion.

The main use of millet in Canada is in mixed bird seed and chicken feeds.

Oils and Nuts – Various kinds of special vegetable oils, nuts, and seeds are sold in health food stores. The special vegetable oils are not superior to the usual ones. The seeds, such as sunflower or sesame, and the nuts are at least one-half fat and one-quarter protein and most of them can be bought more inexpensively in ordinary stores.

Sweeteners – Health food advocates suggest substituting 'natural' sugars for refined white sugar. These 'natural' sugars include the slightly less refined Demerara sugar, raw sugar, brown sugar, honey, and maple syrup. But, except for unpasteurized honey, none of these are actually sold in their 'natural' forms. Besides being more expensive than the usual white sugar, these sweeteners contain very little other than sugar, water, and flavor.

The honey sold in regular stores is nearly always pasteurized to kill the moulds and harmless germs which it naturally contains and which cause changes in its taste and texture when it is kept for some time. These germs and moulds are of no nutritional value. One health food publication stated: "Honey contains many mineral constituents, in fact, most of them and is considered a complete and perfect food. Honey is known to possess distinct antiseptic properties. The free acids in honey favor the absorption of fats. Honey complements iron deficiency in human as well as cow's milk." In actual fact, a serving of honey provides only sugar, water, and very tiny amounts of calcium, iron, riboflavin, and vitamin C. It is not, therefore, an "almost complete" food. As with jam, germs do not grow well in honey because it is about 80 percent sugar, but it would not be used as an antiseptic. Honey does not contain free acids unless it has fermented and its iron content is similar to that of milk, which is very low.

Iodine content in some parts of Canada, for example, around the Great Lakes and in some areas in southern British Columbia, is low in both the soil and water. Therefore, produce raised in these areas is low in this essential nutrient. To guard against any deficiency of iodine, a Food and Drug law was passed years ago making it illegal to sell any salt for table or general household use unless it has been iodized. Such salt must contain a standard, very small amount of iodine, in the form of an iodide.

Sea Salt – The sea salt sold by health food stores is not a safe substitute for iodized salt. It is produced by drying sea water which contains only small and variable amounts of iodine and all of the iodine may be lost in the drying.

There is no evidence that Canadians are short of the various minerals found in sea weed or sea salt.

Food Supplements

One health food enthusiast has been quoted as saying: "Vitamins – they used to come in the food. They don't anymore; you have to take them in pills, capsules, drops." Health food stores do sell a wide variety of supplements, mostly in powder, tablet, or capsule form. Their catalogues and books advise taking these supplements regularly while also eating health foods. Many of these additional food supplements are dried and such processing would certainly reduce their content of some of the vitamins but often the labels do not indicate how much of the vitamins they contain.

EXAMINING THE CASE FOR FOOD SUPPLEMENTS

FOOD SUPPLEMENTS	COMMON FOOD ALTERNATES
• Dried alfalfa, which is a legume and a very good kind of hay	• Green or yellow vegetables, either raw or cooked, offer superior nutritional benefits to that provided by dried alfalfa.
• Dried kelp, a kind of sea weed	• A moderate amount of iodized salt plus other foods can more than replace kelp.
• Calcium tablets, made of ground, dried bone	• Milk and cheese provide a great deal of calcium and many other nutrients as well and are, therefore, superior to dried bones.
• Lecithin, a fat-like substance produced in the body	• The body can easily make sufficient lecithin for itself.
• Dried garlic and parsley tablets	• Garlic has no medicinal value; dried parsley is not nearly as valuable as raw parsley.
• Dried yeast	• Yeast has generous amounts of the B vitamins. However, the body does not need such quantities of them; the excess is merely excreted. For more of the B vitamins, one can sprinkle some raw wheat germ, which can be inexpensively bought at a supermarket, on cereals or cooked in porridge. Even this, however, is unnecessary if ordinary whole grain or enriched cereals and bread are used.
• Vitamin tablets • Mineral tablets	• If one chooses foods from the six major food groups, including vitamin D-fortified milk, sufficient amounts of all the vitamins and minerals may be obtained. Tablets are unnecessary.
• Wheat germ oil and vitamin E capsules	• Wheat germ oil contains considerable vitamin E. However, except in the case of a rare premature baby, no vitamin E deficiency in the human body has been discovered. Claims made that extra vitamin E will improve health in various ways have not been proved.

RAISING FOOD CROPS

On organically-fertilized soil

Many of the salesmen in the health food stores and the authors of health food books inaccurately state that foods raised on soils fertilized with organic fertilizers, such as manure or compost (decaying vegetation) contain more nutrients than the same variety of food grown on land fertilized with chemical fertilizers. Any soil does need periodic fertilization in order to raise plentiful crops but either type of fertilizer results in equally nutritious grains, vegetables, fruits, nuts, and even domestic animals. Today, organic fertilizers are in very short supply and North American farmers could not raise nearly enough food to feed even the North American population itself without the use of harmless and effective artificial fertilizers.

It is interesting to note that the organic fertilizers have to be changed by soil bacteria into inorganic chemical forms, similar to those in chemical fertilizers, before the plants can even use them.

On depleted soil

Health food writers advance the claim that many foods are raised on depleted soils and, therefore, do not contain as much of many of the nutrients as the same foods would, if grown on 'good' soil. Again, this is not supported in fact. Farmers will certainly reap a small harvest from depleted soil but, except for iodine, the composition or nutrient make-up of the vegetables, grains, and other crops is not affected by the soil.

With pesticides

At present, it is not possible to raise food without the use of pesticides. Without sprays, at least 30 percent of produce crops would be destroyed by pests. Actually, when sprays are used most effectively, according to the advice of agricultural experts, very little or none of the sprays remains on the fruit or vegetable when it is ripe. Besides, before being eaten raw, fruits and vegetables should always be washed or peeled to remove any bacteria that might have come from the unclean hands of pickers or handlers.

The Food Directorate of the Federal Health Protection Branch is constantly testing Canadian foods for the presence of pesticides. Only tiny amounts of such substances have ever been found in the foods tested and no harm to human beings from the eating of pesticides in foods has ever been recorded in Canada.

FOOD ADDITIVES

Two different types of food additives are commonly used, those that improve the food's nutritive value and those that improve the food's shelf life, flavor, texture, and appearance.

"Government has a vital regulatory role to play in ensuring that the Canadian food supply is nutritionally adequate. Every effort should be made to formulate and implement nutrition standards for foods sold in Canada."

The Health Protection Branch, staffed by a great many experts in many different fields who work closely with other similar experts all over the world, is the organization that decides what substances can be added to Canadian foods. This branch also sets an upper limit to the very, very low amount of any additive that may be added to any Canadian food. The branch concerns itself not only with the safety and nutritive value of our foods, it also passes regulations designed to save consumers from being deceived either by the appearance or the claims and advertisements made about foods. In its campaign against fraud, the Health Protection Branch is assisted greatly by the more recently established Federal Department of Consumer Affairs.

"Nutrition standards for foods in Canada should set minimum levels of appropriate nutrients to be expected in a food to ensure that foods devoid of nutrients are not marketed to the unsuspecting public. Regulations should ensure the balance of nutrients in foods likely to be consumed as snacks or in place of meals. Encouraging moves have been made with the issuance by Health Protection Branch in 1971 of proposed guidelines for the addition of nutrients to foods."

"Industry bears an enormous responsibility for the shaping and evolution of eating practices of the population. Yet considerations of the nutritive value of a food and its impact on the health of consumers often do not play a role in the development of new food products. It would be in the public interest for industry to routinely consider nutrition in the same way as it does texture, flavor and color. The alternative would have to be strong regulatory measures. These measures would be rather complex to formulate but government should not hesitate to act in the public's interest."

"In Canada, there is a multiplicity of legislation – federal, provincial, and municipal – governing the manufacture and sale of food.

The legislation pertaining to the addition of nutrients to foods under the Food and Drugs Act has a significant impact on the nutritional value of Canadian foods. The Food and Drug Regulations require that all salt sold in Canada for table or general household use contain 0.01% potassium iodide.

The Regulations also permit the enrichment of flour with thiamin, riboflavin, niacin and iron; the addition of vitamin D to all forms of milk; the addition of vitamin C to evaporated milk; the addition of thiamin, riboflavin, niacin, and iron to breakfast cereals and alimentary pastes; and the addition of vitamin C to non-citrus fruit juices, fruit drinks and bases and mixes for fruit and vegetable drinks."

Nutritional Additives

VITAMIN C

As juicing nearly all raw vegetables and fruits, except the citrus fruits and tomatoes, leads to the almost complete loss of their vitamin C, the addition of this vitamin to fruit juices makes them more nutritious foods. The synthetic vitamin C is identical to the natural one.

B VITAMINS AND IRON

Because of the popularity of light, high-risen white bread, the enrichment of white flour with suitable, controlled amounts of the three main B vitamins and iron is of great benefit. Health food authors often advance the claim that enriched white bread and flour are very poor foods or even dangerous ones. They state that many more than these four nutrients, which are replaced by the subsequent enrichment, are removed in the milling. The nutrition experts reply that anyone who chooses food from the six major food groups will obtain enough of all these other unreplaced minor nutrients. Most of the ready-to-eat cereals have also been fortified with the main B vitamins and iron as nutritional additives.

OTHER VITAMINS

Vitamin D is an additive present now in many kinds of milk and in some brands of margarine; vitamin A has been added to skim milk powder.

No additives known to be harmful are allowed by the Health Protection Branch. Before any food processor can use a new additive, it must have been thoroughly tested by being fed in large amounts to many of two different species of animals. These tests must be done by qualified experts and often last two years or more. Also, the proposed new additive must have a beneficial effect that no previously accepted additive has had. The Health Protection Branch carefully scrutinizes these tests and may demand further investigations before it gives permission to the processor to use the proposed new additive.

Improvement Additives

Food processors have discovered that very small amounts of certain chemicals help to keep foods edible, either by improving their baking qualities, by slowing down the process whereby they become stale, or by keeping them smooth-textured. Because bread is made in such enormous quantities and distributed so widely, those additives whch maintain its quality are quite necessary.

The makers of modern convenience foods such as cake mixes, whipped toppings, and snack foods are also major users of these additives.

FOOD POISONING

Occasionally, there is a report of an outbreak of food poisoning. It can be the result of four different kinds of bacteria which have been able to enter the food and increase in numbers, usually because the food has been left in a warm place for some hours before being cooked, served, or refrigerated.

Outbreaks of mild food poisoning are quite common in Canada. Health departments in cooperation with restaurant owners and their associations have recently increased their efforts to train and supervise commercial food handlers so that bacterial food poisoning will not occur. Food poisoning in Canada, due to chemical substances such as pesticides, is extremely rare.

Cause: Staphylococci

The staphylococci bacteria are tiny spheres not visible to the naked eye. They form little grape-like clusters when they increase in numbers. Some breeds or strains of them produce a moderately poisonous substance, called a toxin, when they multiply. These same bacteria may be present in the noses or on the skins of normal people, and can cause boils or infections in cuts. Food can become infected if these people handle food without carefully washing their hands or without waiting for boils or infected cuts to heal.

If some of these bacteria get into moist foods, especially those containing a good amount of protein, such as chicken salad, cream pie, cream puffs, or meat loaf, and if these foods are left in a warm room for two or more hours before they are refrigerated or cooked, these germs multiply and produce their toxin. Even though these infected foods are cooked before being eaten, they can still cause food poisoning because the toxin is not destroyed by heat.

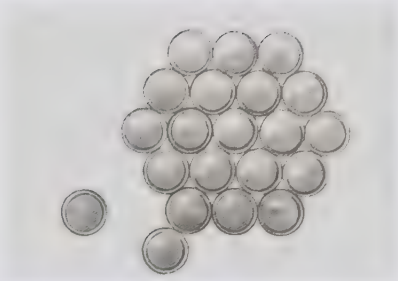
Often people who prepare large amounts of moist food at home for a large party or banquet cannot refrigerate it all because a home refrigerator is too small. Hotels and caterers have very large refrigerators and so can produce such perishable foods safely. When prepared food is kept cold, these bacteria do not increase in number and do not make their toxin. If the food is cooked immediately after it is prepared, the germs are killed and so cannot produce toxin.

Food poisoning due to staphylococci germs can cause cramps in the abdomen, vomiting and, sometimes, diarrhoea. In this kind of food poisoning, the symptoms occur soon after the food is eaten because the irritating toxin that causes them is already in the food.

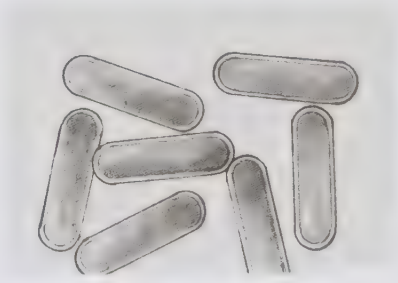
Cause: Salmonella

Salmonella bacteria were named for a bacteriologist, Dr. Salmon. When examined under a microscope, these germs look like tiny rods with rounded ends. A great many different kinds of salmonella bacteria occur in the intestinal canals of many animals such as mice, rats, cockroaches, and flies as well as in those of human beings. People may have these germs in their intestinal canals without being aware of them, and if they are careless, they may transfer some of them to the food they are preparing. Toilet paper does not protect hands from such contamination; thorough washing is needed as well. Provided the food such people are preparing is cooked or refrigerated promptly, the food will not be harmed. However, when moist food, that has been contaminated with these germs, is left in a warm room for two or more hours, the salmonella bacteria multiply rapidly. Mice, rats, and insects can also infect food with these bacteria.

Most people who eat food infected with salmonella bacteria do not become sick immediately. The bacteria usually have to multiply for a day or so in the intestinal canals before they cause diarrhoea accompanied often with one or more of the following – headache, fever, abdominal pain, or vomiting. However, if the food already contains a great many of these germs, the person who ate it may become sick within a few hours. Here again, cooking or refrigerating food as soon as it is prepared prevents such contamination.



What staphylococci look like when greatly magnified by a microscope.



What salmonella looks like when greatly magnified by a microscope.

Cause: Clostridium welchii

This germ is a native of the soil, but it sometimes inhabits the intestinal canals of animals, flies, and man. Clostridium Welchii is a rather unique germ – it does not like oxygen and does not grow well in the presence of air. It, like salmonella bacteria, is shaped like a small rod, and when it grows and multiplies, it too produces a toxin. When conditions are unfavorable for its multiplication – for example, when its food is scarce, Clostridium Welchii produces spores, which are much like dormant seeds. Unfortunately, these spores can withstand boiling for hours. This type of food poisoning can nearly always be blamed on kitchen-prepared meat products.

If a meat stew or meat sauce is contaminated with some of these spores and germs, the common, vegetative form of these germs are killed when the meat is cooked, but the spores will not be destroyed. Therefore, such foods should always be served as soon as possible after cooking and kept hot, at over 140° Fahrenheit until they are served. This temperature will kill the bacteria so that they cannot produce their toxin and the spores will remain as spores. If some of the meat stew or sauce is not eaten and is left to cool, the spores will burst or germinate at 122° Fahrenheit. Then, the active vegetative germs will start to multiply and produce their toxin because there is little air deep in the stew. By the time the food reaches room temperature, it will contain many of these germs and considerable toxin. Putting the food in the refrigerator at this point would stop the increase in germs but would not hurt the

toxin. Unfortunately, this toxin is not destroyed by boiling either, so that when the meat stew or sauce is heated and served the next day, food poisoning could still occur. For this reason, any such leftover food should be put into relatively small containers and refrigerated immediately to prevent the germs from growing and producing toxin. It should be reheated quickly the next day and kept hot at 140° Fahrenheit or higher, because at that temperature the vegetative germs are killed and so cannot produce their toxin.

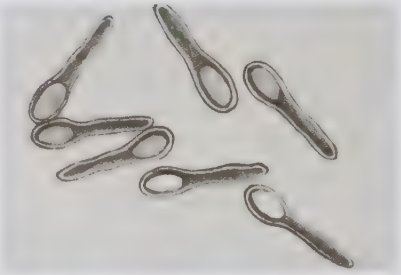
Solid meat, such as steaks, chops, and standing roasts, could only have germs on the outside surfaces, which become very hot when these meats are cooked. Thus, they do not give rise to this type of food poisoning.

Fortunately, the symptoms of this kind of food poisoning, which are much like those already described for salmonella and staphylococci, are not severe and last only a day or two. Elderly people, however, can become very ill.

Cause: Botulinus Bacilli

This is a rare but much more dangerous type of food poisoning. The bacteria that cause it also come from the soil and they also form spores that are difficult to kill.

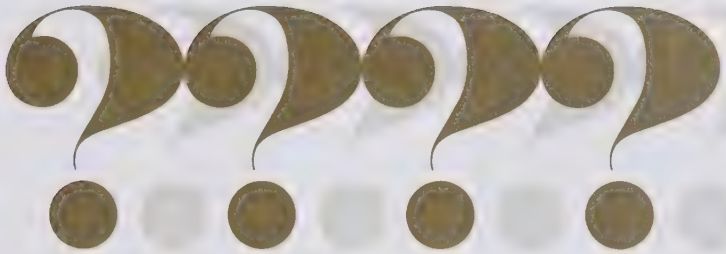
It is extremely rare for any contamination to be present in factory-canned, non-acid products. To guard against contamination of home-canned meat, poultry, fish, and vegetables, except tomatoes and pickles which are both acid, these foods should always be processed in a pressure cooker in which the temperature is above the boiling point of water. Even though this has been done, such home-canned foods should always be boiled for an additional ten minutes before being tasted or served. If the contents of a can or jar look or smell unusual, they should not be eaten. If a can shows a bulge at one end or if its contents spurt out when it is opened, even if its contents have a normal appearance and odor, it should be discarded. This extra pressure means that bacteria in the can are producing gas. Cans that have developed leaks should not be used, although cans that have merely been dented are safe. Also, if all the contents of a can have not been used, the remainder can be safely left in the can or other container in the refrigerator.



What botulinus bacilli look like when greatly magnified by a microscope.

PACKING SAFE LUNCH AND PICNIC FOOD

Lunches prepared the previous evening must be refrigerated overnight. Summer outings should be planned so that the food is carried in a box cooled with ice and then kept in the shade. If both lunch and dinner are to be packed, any prepared sandwiches, salads, and other foods containing meat, fish, eggs, or mayonnaise, should be eaten at the noon meal, not kept for the evening meal. Unopened cans of meat, fish, or poultry, cheese or peanut butter sandwiches, and fresh or canned fruits and vegetables will keep well and will be safe to eat for the evening meal.



1. Answer true or false and give reasons for your answer.
   a) There is danger in eating wrong food combinations, for example, milk and fish.
   b) Vegetable juices are more nutritious than the vegetables from which they are made.
   c) Enriched white bread contains many calories but whole wheat bread, few.
   d) Chemical fertilizers poison the crop.
   e) Fatigue, or lack of energy, is due to vitamin deficiencies in your meals and snacks.
2. Find out all you can about the organization and work of the Food Directorate of the Health Protection Branch of the Department of National Health and Welfare.
3. Discuss whether canned, frozen, and cooked vegetables and fruits should be classified as natural foods.
4. What do you think would happen to the thiamin, vitamin C, and iron in the foods in a TV dinner after they have been factory-cooked and then reheated and served in the home? Explain your answer.
5. Explain why it is better to eat your vitamins and minerals in foods rather than in medicinal preparations.
6. Discuss why health food stores are increasing in number.
7. If possible, invite representatives of your local health department to talk to you about food-borne diseases and to describe the work they do to prevent such diseases in public eating places.

Some people grow more quickly and at an earlier age than do others. Yet, everyone is born with a kind of internal timer and when it is time for that spurt of growth, it will occur. For most, this occurs between the ages of eleven and seventeen years of age.

Some time before that growth spurt, one's bodily appearance begins to change and this continues until one becomes a fully-developed young woman or man. As height increases, some weight is added as well, because muscles and nearly all internal organs have to grow to meet the needs of a larger body. If a person is not overweight in childhood, he or she should not be concerned about putting on some weight at this stage. If one is active and energetic, weight will not increase too much.

While those adolescents who have not yet entered their period of rapid growth may be concerned that they will remain short, these persons may end up being taller than most of their friends. Physicians can tell, from other developmental changes in the body, approximately how far along in the growth cycle a person has progressed.

On the average, most boys are about two years older than most girls when they begin to grow quickly, but they too vary a great deal in the age at which this occurs. Also, their spurt of growth is greater and lasts longer than that of the girls.

Closely associated with the spurt of growth in girls is an increase in the amount of fat just beneath the skin. In most girls, this increase in superficial fat stops at about fifteen years of age. In the girls who grew quickly at an earlier age, it stops earlier; in the late growers, later.

After a person passes through the period of rapid growth in height, muscles and most of the organs are still increasing in size and the bones are not yet completely calcified or hardened. As a result, while becoming stronger and able to do more without becoming too tired, a person at this stage still requires building foods.

HEIGHT-WEIGHT TABLES

It would be so simple if one could look at a height-weight table and know what one should weigh for a particular age and height. Unfortunately, this is not possible. The tables only show, for instance, average weights for adolescents of a given height. Yet, when adolescent, many individuals are at different stages of development.

Another reason why average weight tables for height and age combinations are not accurate enough concerns the fact that each person inherits a particular type of body build, usually from one parent. Some people have wider hip or shoulder bones in comparison to their heights than others. These same individuals also have heavier muscles to match their heavier bones. Others have narrow hips and shoulders, while the rest have what could be called average hip and shoulder widths. Some nationalities and some families have relatively short legs and long trunks; others have long legs and relatively short trunks.

Height - weight tables for adolescent males and females. (after Joint Committee of Health Problems in Education of the NEA and AMA.) (A.A.H.P.E.R., Washington, D.C.)

REDUCING DIETS

When anyone is reducing, he or she needs just as much of the essential nutrients as usual, but fewer calories. This means that the diet must be intelligently planned. Only dietitians, nutritionists, home economsts, or physicians are qualified to plan such diets. These trained persons take into account one's present age, height and weight, previous growth record, and how one looks and feels. They can advise how to cut calories, but still obtain enough of the essential nutrients. They can plan diets which include as many as possible of the foods a patient likes.

Many overweight people fall prey to fad diets and gimmicks. No one food, no special combination of foods, no safe drug will make a person lose weight. The only way for an individual to lose weight is to reduce the total amount of food eaten and to increase the total amount of exercise taken. Reducing the number of calories eaten, though, will not take off excess fat from any one particular area; exercise may reduce the fat by substituting muscle in its place. Regular moderate exercise also helps to control appetite, improve posture and coordination.

It is best to lose no more than one pound a week and, during the reducing process, the individual should be learning new eating habits. After a suitable amount of weight has been lost, the dieter may be able to increase slightly the total amount eaten, but will never be able to eat as much as before beginning the diet.

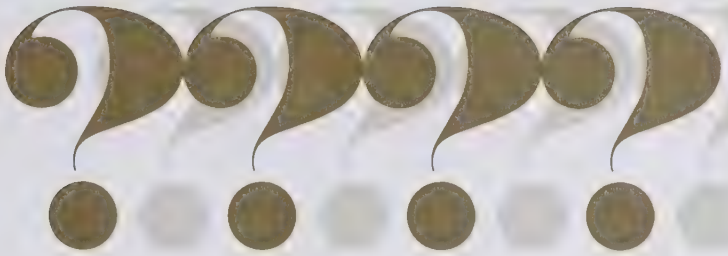
The benefits of successful dieting are real. People are healthier and live longer if they weigh approximately the right amount for their height and body build.

DIETING DURING ADOLESCENCE

Many adolescents fear that they are getting fat when, often, just their shape is changing. Sometimes, in order to curb this tendency, they stop eating some of the foods they particularly need. Possibly all that is needed is to slow or stop weight gain while the individual is still growing in height; many adolescents will 'grow' into their weight. Adolescents should not try to reduce unless their physician advises it and provides them with a suitable diet.

Some girls want to weigh less than is normal for their height and body build. If they are relatively broad-hipped and short-legged, this becomes a constant struggle. Some put themselves on fad diets or stop eating certain valuable foods such as milk in an attempt to trim their figures. No one food–grapefruit, for example, can 'dissolve' fat as is sometimes claimed. A few girls, who partially starve themselves, actually lose their appetites and eventually become quite ill. It is most unwise, at any age, to put oneself on a special or restricted diet.

Some boys are anxious to gain weight. Here again, a doctor can give advice both on eating habits and on the chances of putting on weight as one becomes older. With maturity, shoulders will become broader and muscles will increase in both size and strength, although, of course, one cannot change the inherited body build.



1. List and discuss all the habits and inherited characteristics that can influence your weight.

2. *MAJOR PROJECT: Another way to measure progress*

As you are probably interested in seeing how you compare with other adolescents of your age, we have printed two charts. They are based on the measurements of the heights and weights of a great many healthy adolescents. The charts are on page 137.

These charts are most useful if you have previous records of your height, in stocking feet, and your weight in indoor clothing, without shoes. Possibly your parents, physician, or school nurse would have your records. If not, you can start now and repeat the measurements every six months.

When you are growing quickly, your height or weight may change zones on the charts. For example, a girl who was in the average zones when she was 11, may find she is in the moderately tall and moderately heavy zone when she is 12.

If your height and weight stay in different zones for six months or a year, you would probably be wise to talk to your doctor about your record. For example, if your height stays in the average zone, but your weight climbs into the moderately heavy zone, your doctor may find that you have a heavier than average or stocky build, which you have inherited. This is quite right for you; your proportions are suitable for your frame. On the other hand, if you really are of average build, your move into the higher weight zone means that you are becoming too plump. In this case, your doctor will probably advise you to reduce your weight gains. If you follow this advice, which will probably be to eat fewer very sweet and fat-rich foods, your height and weight will approach the corresponding zones and your proportions will become better.

Your doctor can tell you whether you are one of the slender, 'bean-pole' types or whether you are actually underweight and would do better to add a little more weight.

Adolescents who were too fat before they began to grow quickly are more likely to have a real weight problem. If they are really keen on overcoming it, they should certainly talk to a doctor, a nutritionist, or a home economics teacher about a suitable special diet.

How to Use the Charts

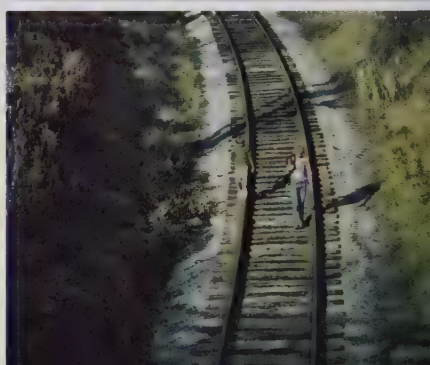
Looking at these charts you see the following details.

1. Age in years is shown along the bottom.
2. Height is shown in inches at the left and right sides of the upper portion.
3. Weight is shown in pounds at the left and right sides of the lower portion.
4. Five zones for height – tall, moderately tall, average, moderately short, and short, are marked in the upper part.
5. The five zones for weight correspond to the height zones. Average height, for example, would correspond to average weight. You will notice that the zones for weight are wider than those for height. This is because people of the same age vary more in weight than in height.

A transparent ruler makes the use of these charts much easier.

1. First, find your age at the bottom.
2. Then, find your height at the side.
3. Follow these lines until they meet and mark this point.
4. In the same way, find the point where your age and weight meet. If your height is average, you would expect your weight to be average; if you are tall, you would expect your weight to fall in the heavy zone and so on. When this occurs, you have the average proportions for your size. Plot all your height-age and weight-age measurements taken at earlier ages on the chart, and draw one line joining all the height-age measurements and, another, all the weight-age measurements.

KNAPSACK LUNGES



Portable lunches are often nutritionally poor. We asked Paul and Matthew, cousins just a few months apart in age, to prepare knapsack lunches for a day's bike ride in the autumn countryside.

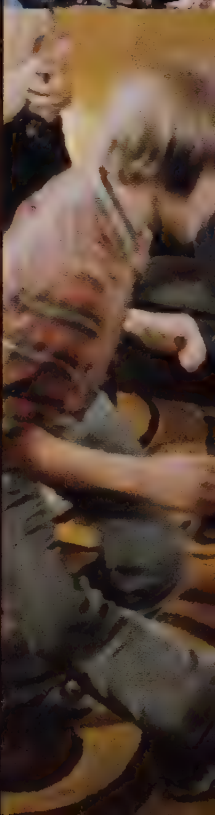
Check both menus (below) against food tables to see how well Paul and Matthew did in selecting their food for lunch.

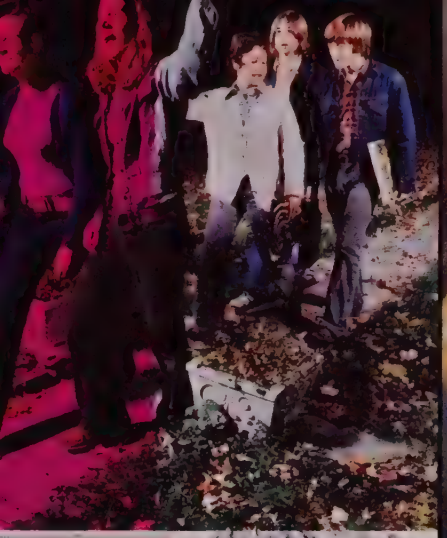
MATTHEW	
bread, white home-style	*4 slices*
margarine, corn-oil	*2 tbsp.*
ham, boiled	*2 slices*
mayonnaise	*2 tbsp.*
cucumber	*1/4 medium*
cheese	*2 oz.*
lettuce	*2 large leaves*
brownie square	*2*
apple	*1 medium*
banana	*1 medium*
hot chocolate	
2-percent milk	*8 oz.*
cocoa	*1 tbsp.*
sugar	*1 tsp.*

PAUL	
bread, white plain	*4 slices*
mayonnaise	*2 tbsp.*
turkey	*2 oz.*
dill pickle	*2 oz.*
vanilla cupcake	
fudge icing	*4*
apples	*2 medium*
carrots	*2 medium*
ginger ale	*2 10-oz. cans*

FRIENDS AND FOOD

Darby and her friends like to get together. We asked them if we could come to their next party so that we could find out the type of food they would prepare and serve. Darby chose the menu, did the shopping, and prepared the food which we then photographed.





L'Anoka

To determine how well this menu met part of the daily requirements for adolescents, consult food tables.

PIZZA

Tomato paste	1	5-oz. can
Mozzarella cheese	1	8-oz. pkg.
Mushrooms	1	4-oz. can
Green pepper	1	medium, raw
Pepperoni	1	8-oz. pkg.
Crust		
Flour	4-6	cups
Yeast, active dry	1	pkg.
Sugar	1	tsp.

Soft drinks	24	10-oz. cans
Corn chips	2	4-oz. packs
Potato chips	2	8-oz. packs
Onion chip dip	2	4-oz. containers
Cashew nuts	1	1-lb. pkg.

3 The Right Combination

MEAL PLANNING

Attractive, satisfying meals do not just happen. They have to be planned and to do this planning well requires knowledge, skill, and imagination. Being able to do this is a useful skill for anyone.

The kinds of meals people plan vary considerably according to such things as the size and ages of the family or group, the kind of work they are doing, and their food preferences. Besides, meal planning will be influenced by the time, energy, skill, and money that is available. Even kitchen equipment will affect choices.

Today's meals are simpler than they used to be; they do not include as many different foods or courses as were common, for example, at the turn of the century. However, if a variety of different foods is served, modern menus will not only be more interesting but more nutritious. Most people are especially fond of the dishes they learned to eat when they were young. These foods may have been traditional in their family or in their national background.

Breakfast

Most people eat a standard breakfast. Choosing a breakfast such as cereal and milk or eggs or bacon or cheese plus toast and cocoa or milk supplies a considerable amount of protein. Yet, any high protein food will serve as a good breakfast choice. Protein is utilized slowly by the body and so helps to keep energy-giving blood sugar at a good level all morning. As a result, hunger is generally not felt before lunch time. Citrus juices and vitaminized apple juice stimulate the appetite in addition to providing a good supply of vitamin C.

Those who generally skip breakfast might try a small amount of any food they like and then gradually increase the quantity. They ought to find improvement in their morning energy levels.

Dinner

The main meal, dinner, whether at noon or in the evening, often follows a standard plan too. It is usually the most expensive meal because meat, which most North Americans prefer as the major item, is expensive. Using less costly cuts in a variety of ways, making the meat flavor go further with the use of extenders, and substituting poultry, fish, and occasionally dried beans for the meat course, help to keep the costs down.

Lunch

Lunches are harder to plan than breakfasts and dinners and can be a test of ingenuity. If lunch is thought of as a real meal, it should contain enough to satisfy body requirements and appetite until the evening meal. Soups, casseroles, salads, eggs in some form, meat or fish sandwiches are often the main items in a lunch. Thin, canned soups, diluted with water, are particularly unsuitable because such soups fill the stomach but give little return in calories and food value. Milk-diluted or thick legume soups are more nutritious.

Carried lunches become very monotonous unless they are carefully planned. Fillings made of meat, poultry, canned fish, peanut butter and jam, or cheese are far more nutritious and have better staying power than those made of jam or jelly. Leftovers can be converted into interesting fillings the night before and refrigerated, ready for use in the morning. 'Finger foods' such as a cooked chicken leg, a meat pie, a ham roll, a hard-boiled egg or wieners, served with a slice of buttered bread, are alternates to sandwiches. For variety, a different kind of bread can be used every few days. A few pickles or lightly salted celery or carrot sticks add a crisp touch to any brown bag lunch. Fruit and baked goods are good desserts. Milk in a thermos is more economical than milk bought where the lunch is eaten.

In buying a cafeteria lunch, one is wise to choose some foods, either in a mixed dish or separately, from all six of the major food groups.

Snacks

While most North Americans have three meals a day, this is certainly not a world-wide habit. Many adolescents and young adults eat snacks as well. These snacks are part of a whole day's food.

SNACKS

BEVERAGES	SIZE OF SERVING	CALORIES	FOOD VALUE
Ginger ale	8 oz.	85	Low: only sugar, flavoring, and water
Cola drink	8 oz.	110	Low: sugar, caffeine, flavoring, and water
Coffee with cream and sugar	8 oz.	85	Low: sugar, caffeine, cream, and water
Fruit drinks	8 oz.	100	Fair: many contain up to half as much vitamin C as vitaminized apple juice
Tomato juice	8 oz.	50	Good: high in vitamin C, a little of other vitamins, minerals, and protein

TABLE CONTINUED

Vitaminized apple juice; orange and/or grapefruit juice	8 oz.	105 (average)	Good: similar to above but much more vitamin C
Skim milk	8 oz.	80	High: calcium, protein, vitamin D, and the B vitamins
2-percent milk	8 oz.	120	High: similar to skim milk, but more fat and vitamin A
Homogenized milk	8 oz.	160	High: similar to skim milk, but more fat, sugar, and calories; no vitamin D
Chocolate dairy drink	8 oz.	190	High: similar to 2-percent milk, but more fat, sugar, and calories; no vitamin D

DRIED PRODUCTS	SIZE OF SERVING	CALORIES	FOOD VALUE
Popcorn	1 cup (popped kernels)	50	Poor: starch and a little protein; higher in calories if fat or sugar added
Raisins	1 1/2 oz. box	120	Fair: some iron but mainly sugar
Peanuts	1 1/2 oz. package	255	Good: considerable protein, iron, and B vitamins
Iron and B vitamin–enriched ready-to-eat cereals	1 cup (1 oz.) dry	110	Good: high iron and B vitamins, some incomplete protein
Above with milk	1 cup (1 oz.) plus 4 ounces of milk	150 to 190	Very good: protein higher and now complete; calories vary with type of milk used

TABLE CONTINUED

FRESH FRUITS	SIZE OF SERVING	CALORIES	FOOD VALUE
Apple	1 small	60	Good, all
Banana	1 medium	90	contain
Grapes	1 medium bunch	55	some vitamins
Orange	1 small	47	and iron;
Peach	1 medium	50	oranges and
Pear	1 large	100	tangerines
Plum	1, 2″ diameter	30	are highest
Tangerine	1	40	in vitamin C

OTHER SNACKS	SIZE OF SERVING	CALORIES	FOOD VALUE
Potato chips	10, large	110	Poor: very little protein, iron or B vitamins but considerable fat
Caramels	3	125	Poor: mostly sugar
Chocolate bar, plain	1 1/2 oz. bar	250	Poor: mostly sugar and fat
Toffee bar	1 1/2 oz.	175	Poor: mostly sugar and fat
Ice cream (in container)	3 1/2 oz.	190	Good: protein, calcium, and B vitamins
Sandwich	Two slices of bread with high protein filling	290	Good: protein and B vitamins

Pie (double crust)	1 piece, average	300	Fair: mostly starch and fat
Hot dog and roll	1	250	Good: protein, iron, and B vitamins
Hamburger and bun	1	415	Good: protein, iron, and B vitamins
Chocolate ice cream soda	1, large	455	Good: calcium, protein, and B vitamins
Chocolate milk shake	1, large	520	Good: calcium, protein, and B vitamins

PLANNING MEALS

Meals that are considered part of a day's menu planning are likely to be more appetizing than if planned one at a time. In fact, it is a good idea to plan meals, in a general way, for three or four days or even for a week at a time, even though they may be changed slightly to allow for the use of leftovers.

☐ Divide the amount of food in the three meals more or less evenly but with somewhat more at dinner than at breakfast and lunch.

☐ Plan to have a fair amount of complete protein, that is, protein of animal origin, in each meal. Milk is particularly suited to being so used.

☐ As a general rule, apart from milk, bread, margarine or butter, do not serve the same food twice in the same day.

☐ Try to imagine how the various items in the meal will look and taste in combination. The meat and vegetables, for instance, should appear attractive together. Both the senses of sight and smell influence appetite and pleasure in eating. Most people find a meal which includes a variety of flavors, textures, shapes, and temperatures an interesting experience.

CANADA'S FOOD GUIDE

'Canada's Food Guide' is a plan for the whole day's meals. Average servings of the suggested foods supply all the nutrients needed by the body for growth, repair, energy, and efficient functioning. The 'Guide' does not restrict choice of foods; meals and snacks can be as varied as one likes. More of some foods than others may be eaten; the total amount of food needed will vary with one's size and activity.

The 'Guide's' recommendations can be met while still keeping costs down.

CANADA'S FOOD GUIDE

MILK

Children (up to about 11 years) 2 1/2 cups (20 fl. oz.)

Adolescents 4 cups (32 fl. oz.)

Adults 1 1/2 cups (12 fl. oz.)

Expectant and nursing mothers 4 cups (32 fl. oz.)

FRUIT

Two servings of fruit or juice, including a satisfactory source of Vitamin C (ascorbic acid) such as oranges, tomatoes, vitaminized apple juice.

VEGETABLES

One serving of potatoes.

Two servings of other vegetables, preferably yellow or green and often raw.

BREAD AND CEREALS

Bread (with butter or fortified margarine).

One serving of whole grain cereal.

MEAT AND FISH

One serving of meat, fish or poultry.

Eat liver occasionally.

Eggs, cheese, dried beans or peas, may be used in place of meat.

In addition, eggs and cheese each at least three times a week.

VITAMIN D

400 International Units, for all growing persons and expectant and nursing mothers.

GOOD SOURCES OF THE KEY NUTRIENTS

FOOD GROUP	NUTRIENT
Milk and cheese	Calcium Riboflavin (B_2) Protein
Fruits and vegetables	Ascorbic Acid (C) Vitamin A
Flour and cereal products	Thiamin (B_1) Iron Protein
Meat, poultry, fish, and eggs	Protein Iron B Vitamins
Many types of milk and some margarines	Vitamin D

These same food groups are the ones shown in Canada's Food Guide which also recommends suitable daily amounts of many of them.

For good growth, health, and energy, enough of some forty different nutrients are needed every day. Fortunately, if foods containing sufficient amounts of only eight of these nutrients are chosen, these same foods will also supply enough of the remaining thirty-two.

FOOD SHOPPING

The type of food bought depends greatly on available time, energy, and food budgets. Those who have full-time jobs outside the home probably buy more partly or fully prepared foods than those with part-time work or no outside jobs. However, too many fully cooked meals such as TV dinners soon grow monotonous and are expensive. In most cases, the consumer has to pay the additional costs of labor that has gone into the preparation of convenience foods. Milk puddings, for example, that are made at home are considerably less expensive than those made with bought mixes. The first type, however, does have a longer preparation time. Canned milk puddings are the most expensive, especially those sold in small tins. Making muffins from 'scratch' may be a little more economical than using a mix but the mix version is considerably faster. Buying ready-made muffins is costly and they are inferior in taste often to those made from mixes.

What consumers buy also depends on the season of the year. When raw fruits and vegetables are plentiful and inexpensive, they should be included in the daily menu. Many newspapers carry articles describing which foods are in abundant supply and this usually means that at this particular time they are at their least expensive. The large stores also

advertise specials. Sometimes these are a real bargain either because the stores use a 'loss leader' hoping to bring shoppers into the store or because they want, for some reason, to get rid of that particular merchandise. Sometimes, so-called bargains are not really lower in price. Comparison shopping in the neighborhood can save food dollars. If the low-priced items are fresh fruits or vegetables that are past their best, one should not buy more than can be used within a short time.

The size of individual foods bought also varies. Usually, large cans or packages are cheaper per ounce. Yet, one of the problems for the shopper is to know how many servings a pound or a can or a package will provide. The size of the servings varies with the age and activity of the individual eating them. Young children and elderly people, for instance, usually eat smaller servings than do energetic adolescents or adults doing heavy work.

To find how much each ounce of a product costs in comparison with a similar product, one may order a 'Consumer's Cost Calculator,' for a small charge, from the Food Advisory Service of the Canada Department of Agriculture, Ottawa.

A FOOD BUYING GUIDE

MEAT	MARKET UNIT	APPROXIMATE NUMBER OF SERVINGS
BONELESS OR GROUND		
Sausages, liver	1 lb.	4
MEDIUM AMOUNT OF BONE		
Rib, chuck or rump roasts, steak with bone in	1 lb.	2–3
LARGE AMOUNT OF BONE		
Short ribs, spare ribs	1 lb.	1–2
COLD COOKED SLICES	1 lb.	5–6
Poultry	1 lb.	2–3
Fish		
Sticks	1 lb.	4
VEGETABLES		
DRIED		
Beans or peas	1 lb., dry	9–12
FRESH		
When cooked, except corn and squash	1 lb.	4
FROZEN	10 or 12 oz.	4
CANNED	19 oz.	4

TABLE CONTINUED

GRAIN PRODUCTS	MARKET UNIT	APPROXIMATE NUMBER OF SERVINGS
Ready-to-eat cereals	16 oz.	16
Oats, rolled, uncooked	1 lb.	16
Rice, brown or white,	1 lb.	12
Bread	24 oz. (1½ lb.)	24 slices
	16 oz. (1 lb.)	16 slices
PASTAS		
Macaroni or spaghetti	1 lb.	14
FRUIT		
FRESH		
Blueberries	1 qt.	4
Cherries	1 lb.	4
Grapes	1 lb.	4
Peaches	1 lb.	4
Strawberries	1 qt.	4
CANNED	19 oz.	4
DRIED		
Pitted prunes	12 oz.	6
Ice Cream	1 qt.	8

USING A SHOPPING LIST

☐ Keep a notepad on which to jot down any items needed, especially staples, such as flour, sugar, cereals, and potatoes.

☐ Before going shopping, plan the meals to be served in the next few days or even better, in the next week.

☐ Make a list of all foods needed, listed, if possible, in the order in which they are arranged in the store. This will save time and effort.

☐ Make the list flexible so that if, for instance, fresh-looking green beans are not available, squash or spinach can be substituted.

☐ If the shopping list is a long one, buy the frozen items last. At home, put the frozen food into the freezer immediately.

LABELLING FOODS

Recent tests carried out by several public and private organizations on thousands of consumers in the United States, revealed that many would like to see the nutrient content of ordinary servings of foods stated on labels. The consumers tested were given a choice of several different types of labels. The majority preferred the label on which were stated the approximate percentage amounts, in an ordinary serving, of four key vitamins – vitamin A, thiamin, riboflavin, and vitamin C, and also of niacin and the two key minerals, calcium and iron. The percentages suggested were 5, 10, 15, 20, 30, 40, 50, 60, 70, 80, 90, and 100 percent of the recommended daily quotas, usually for adults. In addition, the number of calories and the number of grams of carbohydrate, fat, and protein in an ordinary serving were to be listed on the label.

Permission for food processors to label their products in this way, if they wish, has now been passed by the Food and Drug Administration in the United States. There is a very good chance that, in the future, this type of labelling will also be adopted in Canada.

METRIC CONVERSION TABLE

VOLUME	
1 drop =	0.05 cm^3*
1 fluid oz. =	28.4 cm^3
1 teaspoon =	5 cm^3
1 tablespoon =	15 cm^3
1 cup (8 fl. oz.) =	227 cm^3
1 pint =	0.57 dm^3†
1 quart =	1.14 dm^3
MASS	
1 oz. =	28.35 g
1 lb. =	0.45 kg
LENGTH	
1 inch =	2.54 cm

*cm^3 is a cubic centimetre or a millilitre
†dm^3 is a cubic decimetre or a litre

1. Discuss why the kind of food you eat, while important to you now, is also important to you in the future. Can you find at least four reasons for this to be so?
2. Discuss the following statement: "Malnutrition, caused by eating poor meals and snacks, is just as apt to be due to nutritional ignorance as to low income."
3. Plan a one-day, minimum cost but adequate diet for two teenage girls who are moderately active. Why should you plan ahead what you are going to eat the next day?
4. What can one do to reduce waste in the buying, storing, and cooking of foods?
5. What can a good breakfast do for you?
6. Plan a dinner for your family. If possible, do all the shopping, preparing, and serving.
7. Describe a number of easy and inexpensive garnishes that make main dishes and milk desserts more attractive.
8. Why do many people think that cold noon meals are less nourishing than hot ones? Is there any reason for this belief? What kind of meals would you plan for very hot weather and why would you do so?
9. Which common foods are not listed in 'Canada's Food Guide?' Why are they not?
10. Look up a recipe for chocolate blancmange, using cocoa, that contains about 2 cups of milk. Compare its cost with a similar pudding made from a mix and with the same amount of this type of pudding bought in cans. Use food tables.
11. Compare the 'Basic Four Guide,' which is commonly used in the United States, with 'Canada's Food Guide.'
12. Plan the meals for a week for a family of four, in which the two children are a boy of 10 and a girl of 14.
13. Find out which foods many girls 13 to 20 years old are most apt to eat too sparingly. Of which nutrients would they be short as a result? What effects could these deficiencies have on their present and future health?
14. Describe two ways in which the new type of labelling could benefit both customers and food processors.
15. Collect food advertisements from newspapers and magazines and also jot down what is said in some of the television ads. Have they affected your own or your parents' choice of foods? If possible, tape some of the advertising jingles and discuss them at school.

16. Describe the factors that can influence one's likes and dislikes of certain foods. Which of these factors apply to your own food preferences?
17. Research some of the unusual new foods that have been developed by the chemists, such as simulated 'bacon' bits. Do simulated 'bacon' bits, for example, contain all the nutrients present in bacon?
18. Ask your relatives and friends in other parts of Canada to give you a distinctive recipe which is popular in their area. Try to get one from each province. If you can, make some of these regional dishes.
19. *MAJOR PROJECT: To discover how well your meals are planned*

    For three consecutive days, including one day of a weekend (for example, Thursday to Saturday or Sunday to Tuesday) write down everything you eat and drink in meals and snacks, except water. Eat the way you normally do. Record the amounts in cups, slices, ounces, teaspoons, and so on, and also how it was prepared, whether raw, boiled, fried, or by whatever method used. Be sure to include such extras as butter, jam, cream, and soft drinks. If possible, record the food just as soon as you have eaten it. It is even better to keep a record for a whole week. Then score each day's food in the way described in the following Food Score. First, write down your scores under headings, Groups I, II, III, IV, and V. Then, in each group, calculate your average for the three or seven days. Decide if your score was fair, good, or very good. Check your record to see in which nutrients you were low. In what group did you do most poorly? How could you improve your score in a way agreeable to you?

HOW DO YOUR MEALS SCORE?

For each food group, based on 'Canada's Food Guide,' there is a maximum score. Fruits and vegetables are essentially interchangeable, so they are grouped together with a maximum allowance of 40 points.

Do not give yourself more than the allotted number of points in each group. Extra foods in one group do not compensate for too few in another.

Some equivalent foods are suggested in each group. You can easily determine other equivalents.

Try to recall the menus for the day and the foods included. Was there a salad, a stew, or a casserole? Did they contain foods from the meat, vegetable, cereal, or milk group? Many meals are 'all-in-one' and count points in several groups.

Score the point value of the foods eaten from each group during the day. Place the correct number of points in the box for each group. Total the points from each group in the box at the end of the sheet. Rate your daily food intake accordingly.*

GROUP I – MILK AND CHEESE

Maximum 20 points

Total your point score for milk taken as a beverage, for milk contained in other foods, and for cheese. (1 cup =8 fluid ounces). Count points as indicated. Maximum: 20 points.

4 cups – 20 points	2 cups – 10 points
3 cups – 15 points	1 cup – 5 points

The calcium value of the following foods is equal to that of 1 cup of milk.

1 1/2 oz. cheddar cheese (two 1" cubes)	4 oz. canned salmon (with bones)
1 1/2 oz. processed cheese	1 cup cream soup
12 oz. cottage cheese	1 cup milk pudding
4 tbsp. skim milk powder	1 cup ice cream

GROUP 1 – MAXIMUM COUNT, 20 POINTS

	YOUR DAILY SCORE						DAILY AVERAGE
DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	

GROUP II – FRUITS AND VEGETABLES

Maximum 40 points

How many servings of fruits and vegetables did you have? Maximum: 20 points.

5 servings – 20 points	2 servings – 8 points
4 servings – 16 points	1 serving – 4 points
3 servings – 12 points	

GROUP II CONTINUES

*Based, with modifications, on score sheets prepared by Nutrition Service, Ontario Ministry of Health.

Did these fruits and vegetables include a good source of vitamin C? Maximum: 10 points.

Count 10 points for:
- 1/2 grapefruit
- 1 fresh orange
- 4 oz. orange, grapefruit, or vitaminized apple juice
- 1/4 cantaloup
- 10 strawberries
- 2/3 cup broccoli
- 2/3 cup cauliflower
- 1/2 cup spinach
- 1/2 cup turnip
- 2/3 cup Brussels sprouts
- 1 large potato (cooked in skin)

Or 5 points for:
- 1/4 honeydew melon
- 1 medium tomato
- 1/4 medium green pepper
- 6 spears asparagus
- 1/2 cup green beans
- 1/2 cup cabbage
- 1/2 cup peas
- 1/2 cup sweet potato

Were any of the vegetables green (providing iron and vitamin A), or were any of the fruits and vegetables yellow (providing vitamin A)? Maximum: 5 points.

Did you have raw fruits or vegetables during the day? Maximum: 5 points.

GROUP II – MAXIMUM COUNT, 40 POINTS

YOUR DAILY SCORE							DAILY AVERAGE
DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	

GROUP III – CEREALS AND BREAD

Maximum 20 points

Did you have three or more servings of a whole grain or fortified cereal in any form, or their equivalent in bread or bread alternates? Count 5 points per serving. Maximum: 15 points.

Whole Grain Fortified Cereals:

Rolled Oats	Grapenuts
Rolled Wheat	Alpha-Bits
Shredded Wheat	All-Bran
Muffets	Raisin Bran
Special K	Bran Flakes and others

Mixed whole grains, e.g. Vita B, Brex, Red River

GROUP III CONTINUES

Bread (one slice per serving):
- Whole wheat
- Cracked wheat
- White enriched
- Hovis
- Oatmeal
- Rye
- Raisin or Fruit breads

Bread Alternates:
- 1 Muffin or Roll
- 3 Ry-Krisp
- 2 Oatmeal Cookies
- 1 slice Fruitcake
- 2″ piece of Gingerbread
- 1 cup Spaghetti with Vitamins added
- 1 cup Macaroni with Vitamins added
- 1 cup Brown or converted rice
- 1 cup noodles

Did you have butter or fortified margarine with your meals?
Count 5 points. Maximum: 5 points.

GROUP III – MAXIMUM COUNT, 20 POINTS

YOUR DAILY SCORE							DAILY AVERAGE
DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	

GROUP IV – MEAT, FISH, POULTRY, AND ALTERNATES

Maximum 20 points

Your point score will be 10 points for each serving of meat, fish, poultry, or alternates. Maximum: 20 points

Alternates
- 1/4 cup peanut butter
- 3 oz. cheese
- 1 cup cooked lima, navy, kidney, or other dried beans, peas, or lentils

GROUP IV – MAXIMUM COUNT, 20 POINTS

YOUR DAILY SCORE							DAILY AVERAGE
DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	

GROUP V – VITAMIN D

Maximum 10 points

Aim for a total daily intake of 400 International Units of vitamin D, either from your meals or from vitamin D preparations in tablet, cap-

sule, or drop form. Check labels on fluid milk, dried milk, evaporated milk, and margarine, for the number of units they supply.
Count 1 point for each 40 International Units you receive. Maximum: 10 points.

GROUP V – MAXIMUM COUNT, 10 POINTS

YOUR DAILY SCORE							DAILY AVERAGE
DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	

YOUR TOTAL POINT SCORE

Maximum 110 points

Total your point score from each of the five groups and enter the totals here:

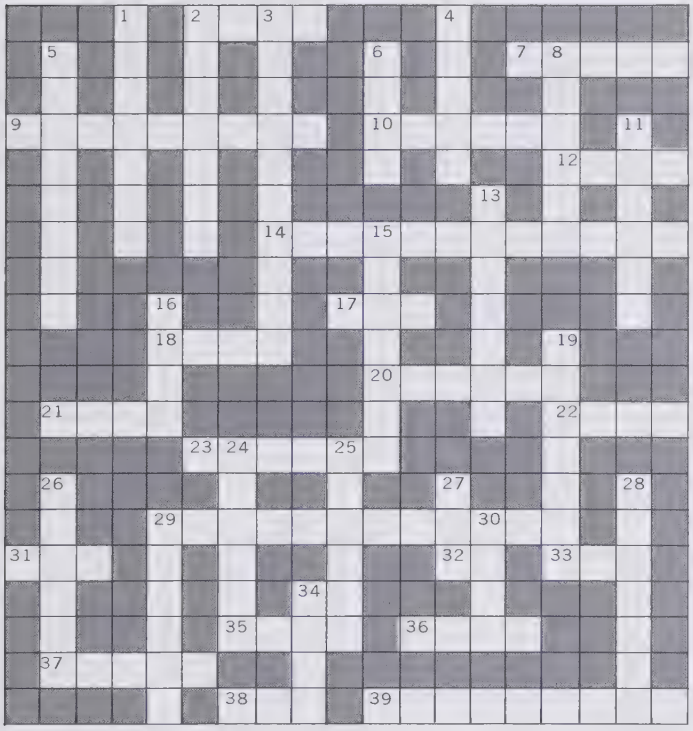
MAXIMUM TOTAL COUNT – 110 POINTS

YOUR DAILY SCORE								DAILY AVERAGE
GROUP	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5	DAY 6	DAY 7	
I								
II								
III								
IV								
V								
TOTAL								

You may now rate your daily food intake, based on your daily average. If your score is below 80, you must definitely strive to improve your food selection.

FAIR	GOOD	VERY GOOD
Below 80	80 - 94	95 or over

20. CROSSWORD PUZZLE



DOWN

1. Nutritious carbohydrate breakfast foods.
2. Fish is a high _____ food.
3. Vitamin B_2 is also known as _____.
4. A food that supplies quick energy.
5. A deficiency of this vitamin causes beri-beri.
6. Satisfies hunger.
8. A type of disease caused by a lack of iron.
11. A liquid secreted in the mouth that moistens and softens food.
13. A source of vitamin D (two words).
15. A condition that can be caused by continuous overeating.
16. Growing boys and girls should drink at least three to four glasses a day.
19. Incomplete proteins such as dried peas, dried beans, and lentils are classified as _____.
24. A group of fruits that are high in ascorbic acid.
25. Vitamin A is essential for normal _____.
26. This vitamin maintains the normal function of the nervous system, skin, and digestive tract.
27. An excellent source of vitamin D.
28. Phosphorus is classified as a _____.
29. Overeating or undereating has a great influence on a person's _____.
30. Calcium is one of the nutrients required for this part of the body (singular).
34. A gram of fat equals _____ calories.

ACROSS

2. When raw or partially cooked, this meat may cause trichinosis.
7. A liquid essential for life.
9. A process whereby food is broken down in the body so that it may be absorbed.
10. A fruit high in vitamin C.
12. A good source of complete protein, iron, and the B vitamins.
14. Another name for vitamin C (two words).
17. A beverage that has no nutritive value and is especially popular in England.
18. A mineral that builds haemoglobin in the blood.
20. A mineral required for the proper functioning of the thyroid gland.
21. That portion of the egg containing iron.
22. One _____ of fat equals nine calories.
23. Adequate amounts of vitamin C prevent this disease.
29. Some vitamins are destroyed by prolonged cooking in a large amount of water because they are _____.
31. A type of diet that is highly unreliable as a food guide.
32. Does the lack of vitamin D cause beri-beri?
33. The ultraviolet rays from the _____ are converted into vitamin D in the skin.
34. Can vitamin pills be a substitute for a balanced diet?
35. A poor diet can cause _____ blemishes.
36. A plan for eating.
37. Deficiency of vitamin A can cause _____ blindness.
38. A dessert high in calories.
39. For maximum nutritive value, this must be cooked in a small amount of water until just tender.

FOOD TABLES ON PAGES 159 TO 171

21. *MAJOR PROJECT: To discover the kind of information food tables can provide*

At the top of the following food tables, the recommended daily quotas of calories, protein, calcium, iron, vitamin A, thiamin, riboflavin, and vitamin C for Canadians 13 to 15 years of age are shown. The tables themselves show how many calories and how much of these seven nutrients one ordinary serving of each food provides.

Organize yourselves into groups of seven persons, each one of the seven then choosing a different nutrient to study. Work out what 10 percent of the daily quota of your chosen nutrient is. With vitamin A, the amount would be 270 I.U., which is quite a sizeable proportion of your daily intake. Write this percentage figure, i.e. 270 I.U. of vitamin A, on a piece of paper which you can then move from page to page in the tables.

Divide a page of your notebook into three vertical columns. Label the column on the left 'Foods' and the next one, 'Amount of vitamin A' or whatever nutrient you have chosen.

Go through the tables and write down in the first column, the names of all the foods that give you 10 percent or more of your daily quota, for example, 270 I.U. or more of vitamin A. In the second column, note how much of each nutrient a serving would give you. In the third column, you could calculate the approximate percentage of your daily quota provided by each of the servings you have listed. For example, the first of these entries for vitamin A would be as follows:

Foods	*Amount of vitamin A*	*Percentage of daily quota*
Canned apricots	1500 I.U.	55 percent
Canned asparagus	690 I.U.	25 percent
Cooked green beans	400 I.U.	15 percent

When you have gone through the tables for vitamin A in this way, summarize your results. Which types of food gave you the most of it? Choose another nutrient and see what the tables tell you. Remember when you are working on protein, to note whether it is complete or incomplete in each food selected.

		CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Daily Canadian											
Dietary Standards for	BOYS	3100	–	–	75	1200	12	2700	0.9	1.6	30
13-15 years of age	GIRLS	2600	–	–	75	1200	12	2700	0.8	1.3	30
Apple, 1 small McIntosh		60	14	0.3	0.3	6	0.3	100	0.04	0.03	3.5
Apple, 1 large Spy		76	17	0.5	0.4	8	0.4	120	0.05	0.04	27
Apple juice, vitaminized 4 oz.		60	16	0	0.1	7	0.6	50	0.01	0.04	40
Applesauce, 1/2 cup		100	24	0.2	0.2	5	0.5	30	0.02	0.01	1
Apricots, canned, 1/2 cup		110	27	trace	0.7	11	0.3	1500	0.02	0.02	4
Asparagus, canned, 1/2 cup		22	3.4	0.4	2.2	21	2	690	0.09	0.1	16
Bacon, side, 3 slices, lean		185	trace	13.5	6	4	0.6	0	0.14	0.06	0
Banana, 1 medium		90	22	0.2	1.2	8	0.6	200	0.04	0.05	8
Beans, green, 1/2 cup											
– fresh or frozen		25	5.5	0.2	1.0	50	0.5	400	0.05	0.05	10
– canned		25	5	0.2	1.0	27	1.3	400	0.03	0.04	5
Beans, wax, 1/2 cup											
– fresh or frozen		25	5	0.2	1.4	35	0.6	150	0.05	0.05	6
– canned		25	5	trace	0.9	22	1.0	150	0.03	0.04	5
Beans, with pork, 1 cup		290	44	7	13	130	5	60	0.12	0.1	2
Beans, lima, 1/2 cup											
– frozen		100	19	trace	6	20	2	230	0.07	0.05	17
– dried, cooked		140	26	0.6	8	29	3	0	0.13	0.06	0
Beef, hamburger, 1 large		315	0	26	20	9	2.5	0	0.08	0.15	0
– oven roast, 3 oz., cooked		260	0	20	20	7	3	0	0.04	0.13	0
– pot roast, 3 oz., cooked		270	0	20	23	10	3	0	0.04	0.18	0

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Beer, 8 oz.	115	10	0	1.5	10	0	0	trace	0.07	0
Beets, cooked, 1/2 cup	35	8	0	1.0	18	0.6	15	0.015	0.03	6
Blancmange, 1/2 cup	170	24	6	5	175	0.2	200	0.04	0.2	0
Blueberries, fresh, 1/2 cup	50	11	0.4	0.4	11	0.6	200	0.01	0.1	7
Bologna, 2 slices, 2 oz.	130	2	9.5	9.0	5	1.3	0	0.07	0.08	0
Bran flakes, 1 oz., fortified	115	24	0.6	3.3	20	4 or 6	0	0.6	1.0	0
Brazil nuts, 2, 1/2 oz.	100	2	10	2.2	30	0.5	trace	0.13	?	0
Bread, 1 slice, 1 oz., enriched white	80	16	0.6	2.5	22	0.7	0	0.07	0.04	0
– 100 percent whole wheat	80	16	0.8	2.5	15	0.7	0	0.07	0.03	0
– 33 percent rye	80	16	0.4	3	22	0.7	0	0.07	0.03	0
– unenriched white	80	16	0.6	2.5	9	0.2	0	0.02	0.02	0
Broccoli, cooked, 1/2 cup – fresh or frozen	26	4	0	2.5	100	1	2500	0.05	0.11	55
Brussels sprouts, 1/2 cup	45	6	1	3	22	0.8	260	0.02	0.08	30
Butter, 1 tablespoon	110	0	12	0	3	0	500	0	0	0
Cabbage, raw, 3/4 cup	14	2.5	trace	0.7	23	0.2	40	0.03	0.02	25
– cooked, 1/2 cup	23	4.5	trace	1.0	39	0.4	75	0.02	0.02	25
Cake, fruit, dark, 2" x 2" x 1/2"	110	17	4	2	30	0.8	120	0.04	0.04	0
– chocolate, iced, moderate serving	300	55	7	3	40	0.5	300	0.03	0.10	0
– plain, 3" x 2" x 1 1/2" or 1 cupcake	180	30	5	4	85	0.2	200	0.02	0.05	0

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Candy, hard, 2 oz.	220	55	0	0	0	0	0	0	0	0
– marshmallows, 1 oz.	95	23	0	0.9	0	0	0	0	0	0
– chocolate, plain milk 2 oz.	325	30	22	2	9	0.9	0	0.015	0.06	0
– chocolate, with nuts, 1 1/2 oz.	260	22	17	4	93	1.3	60	0.06	0.23	0
Cantaloup, 1/2 small	50	10	0.4	1.3	30	0.7	6200	0.09	0.07	60
Carrots, raw, 1, 5 1/2" x 1"	20	4	0	1	20	0.4	11000	0.03	0.03	3
– cooked, 1/2 cup	24	5	0.5	1	20	0.4	12500	0.03	0.03	3
Cauliflower, 1/2 cup	25	4	trace	2.0	13	0.6	55	0.03	0.05	55
Celery, raw, 1 large outer stalk	10	1.9	trace	0.7	25	0.3	0	0.02	0.02	4
– cooked, 1/2 cup	13	2.4	trace	0.9	33	0.3	0	0.02	0.02	3
Cereal, ready-to-eat, fortified with iron ¢3 main B vitamins, 1 oz.	110	2.2	trace	2.5	3	4 or 6	0	0.6	1.0	0
Cheese, 1 oz., cheddar	110	0.5	9	7	205	0.3	390	trace	0.11	0
– whole milk process	107	0.6	8.5	7	190	0.3	370	trace	0.11	0
– skim milk process	58	2.0	2	7	325	0.3	90	trace	0.11	0
Cheese spread, 1 oz.	100	2.0	8	5	115	0.2	240	trace	0.11	0
Cheese, cottage, creamed 1 oz.	30	1	trace	4.0	27	0.1	50	trace	0.08	0
Cheese, cream, 1 oz.	110	trace	11	2.5	19	0.1	410	trace	0.06	0
Cherries, canned, 1/2 cup	120	29	0	0.7	13	0.3	350	0.03	0.02	3
– raw, 1 cup	65	16	0	1	19	0.4	710	0.05	0.06	9

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Chicken, roasted, 3 oz.	175	0	9.0	23	14	1.5	0	0.08	0.16	0
– 1/2 breast, fried in batter	230	3	12	27	19	1.3	0	0.07	0.1	0
Chocolate dairy drink, 8 oz.	190	27	6	8	295	0.5	210	0.10	0.4	2
Cocoa, dry, 1 tablespoon	20	1.1	1.7	0.6	9	0.8	trace	0.01	0.03	0
Cod, fried, 4 oz.	120	0	6.0	17	31	1.0	180	0.08	0.11	0
Cola drink, 8 oz.	110	28	0	0	0	0	0	0	0	0
Cookie (oatmeal), 1 large	110	19	3	2	0.5	0.2	0	0.06	0.04	0
Corn, boiled, 1 small ear	100	21	0.5	3	5	0.6	390	0.11	0.1	8
– 1/2 cup, canned cream style	100	22	0.7	2.5	3	0.7	20	0.03	0.05	6
– 1/2 cup, vacuum packed	95	20	0.5	2.5	5	0.6	260	0.03	0.06	7
Corn flakes, 1 oz., fortified	106	24	trace	2.4	3	4	0	0.6	1.0	0
– not fortified	106	24	trace	2.4	3	0.3	0	0.01	0.03	0
Corn oil, 1 tablespoon	126	0	14	0	0	0	0	0	0	0
Corn syrup, 2 tablespoons	120	30	0	0	18	1.5	0	0	0	0
Crackers, graham, 2	55	10	1	1	3	0.3	0	0.04	0.02	0
– soda, 2	50	9	1	1	2	0.2	0	0.01	0.01	0
Cucumber, 8 slices	7	1.4	0	0.4	5	0.2	0	0.02	0.02	4
Cream, 18 percent, 1 oz.	53	1.2	5.1	0.8	29	0	210	0.01	0.04	trace
Doughnut, 1 cake type	130	17	6	2	23	0.2	40	0.05	0.04	0
– 1 yeast-leavened	145	18	7	2	24	0.2	42	0.05	0.04	0

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Egg, 1 medium, cooked in water	70	trace	5	6	26	1.2	500	0.04	0.16	0
– fried	105	trace	9	6	26	1.2	550	0.04	0.16	0
Farina cereal, cooked 3/4 cup, 1 oz. dry	107	23	0.2	3.3	8	0.3	0	0.01	0.02	0
Fish sticks, frozen, cooked 3 oz.	140	5	9	14	9	0.3	0	0.03	0.08	0
Flour, see wheat, rye, soy										
Fruit Cocktail, canned, 1/2 cup	90	22	0.2	0.5	23	1.0	400	0.03	0.03	5
Gelatin, dessert jelly, 1/2 cup	60	14	0	1	0.2	0	0	0	0	0
Ginger Ale, 8 oz.	84	21	0	0	0	0	0	0	0	0
Grapefruit, white, 1/2 small	45	11	trace	0.5	25	0.2	trace	0.04	0.02	45
– canned, 1 serving	82	20	trace	0.6	13	0.3	trace	0.03	0.02	30
– juice, diluted frozen, 4 oz.	45	11	trace	0.5	9	0.3	trace	0.03	0.02	45
Grapes, Canadian, 1 moderate bunch	55	12	trace	1	15	0.5	60	0.05	0.04	3
– imported, 1 cup	110	26	0.6	1	33	0.9	120	0.09	0.06	6
– juice, bottled, 8 oz.	180	45	0	1.0	25	0.8	0	0.09	0.12	trace
Haddock, fried in batter, 3 1/2 oz.	150	7	5	19	18	0.6	0	0.04	0.09	0

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Ham, fried, 3 oz.	330	0	28	20	9	2.5	0	0.46	0.18	0
Hamburger, see beef										
Heart, cooked, 3 oz.	85	0.6	3	14	8	3.9	30	0.50	0.75	5
Ice Cream, 1/7 of quart brick, regular	170	17	10	3.2	100	0.1	420	0.03	0.15	0
Ice milk, vanilla, 1/6 brick	170	21	7.5	5	189	trace	150	0.07	0.27	0
Jams and preserves, 1 tablespoon	60	15	trace	trace	2	0.1	trace	trace	trace	trace
Jellies, 1 tablespoon	52	13	trace	trace	2	0.1	trace	trace	trace	trace
Kidney, braised, 3 oz.	190	trace	12.0	20	18	13	1100	0.5	4.8	0
Lamb, roast leg, 3 oz.	265	0	17	28	13	2.2	0	0.16	0.3	0
– chop, large, 4 oz.	400	0	33	25	10	3	0	0.14	0.25	0
Lard, 1 tablespoon	125	0	14	0	0	0	0	0	0	0
Lettuce, head, 2-4 leaves	5	1	trace	0.4	7	0.2	160	0.01	0.02	2
Lima beans, see beans										
Liver, beef, fried, 2 oz.	115	5.5	4.5	13.5	5	4.5	30,000	0.15	2.2	18
Luncheon meat, canned pork, 2 oz.	165	0.9	14	9	5	1.2	0	0.18	0.12	0
Macaroni, unenriched, 1 cup, cooked	205	42	0.8	7	13	0.8	0	0.03	0.02	0
– enriched with B vitamins and iron, 1 cup cooked	205	42	0.8	7	13	1.5	0	0.24	0.15	0

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Margarine, 1 tablespoon	110	trace	12	trace	3	0	500	trace	trace	0
Martini, 3½ oz.	140	0	0	trace	0	0	0	0	0	0
Milk, 8 oz., homo or whole	160	12	8	8	280	0.2	380	0.09	0.4	2
– 2 percent	120	12	4	8	295	0.2	170	0.10	0.4	2
– skim	80	12	0.2	8	295	0.2	trace	0.09	0.4	2
– buttermilk (usually 2 percent B.F.)	120	12	4	8	295	0.2	170	0.10	0.4	2
Molasses, light, 1 tablespoon	50	13	0	0	33	0.9	0	0.01	0.01	0
Muffets, 1	95	20	0.4	3	12	1.0	0	0.06	0.02	0
Muffins, 1, corn	115	17	4	3	30	0.7	200	0.08	0.10	0
Mushrooms, canned, ½ cup	26	4	0.2	2	8	1.0	0	0.02	0.30	0
Muskmelon, see cantaloup										
Oatmeal, or rolled oats, ¾ cup cooked, 1 oz. raw	118	21	2	4	13	1.3	0	0.19	0.04	0
Oils, salad, 1 tablespoon	126	0	14	0	0	0	0	0	0	0
Onions, boiled, ½ cup	40	9	trace	1	33	0.5	55	0.02	0.03	6
– green, 6	25	6	trace	trace	68	0.4	30	0.02	0.1	12
Orange, 1 medium	50	12	trace	1	35	0.4	200	0.08	0.03	53
– juice, fresh or diluted frozen, 4 oz.	50	12	trace	1	17	0.3	200	0.08	0.03	57
Pancakes, 1, from enriched mix	55	7	2	2	43	0.4	50	0.05	0.06	0

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Peaches, raw, 1 medium	50	12	trace	1	8	0.6	880	0.02	0.05	8
–canned, heavy syrup, 1/2 cup	95	23	trace	1	6	0.5	880	0.02	0.05	5
Peanuts, salted, 1 1/2 oz.	255	10	19	11	21	0.5	0	0.09	0.04	0
Peanut butter, 1 tablespoon	90	3	7	4	10	0.3	0	0.02	0.02	0
Pears, raw, 1 small	50	12	trace	0.5	10	0.2	10	0.01	0.03	3
– canned, medium syrup, 2 halves and 2 tablespoons juice	85	21	trace	0.2	9	0.2	trace	0.01	0.02	2
Peas, green, frozen, 1/2 cup	60	10	0.3	5	17	2	600	0.2	0.11	12
– canned, 1/2 cup of solids	80	15	0.5	5	25	1.7	690	0.1	0.05	8
Pie, enriched flour, 1/6 of 9" pie, apple	375	60	14	4	11	0.5	155	0.04	0.03	1
– custard	265	33	12	7.5	110	0.8	300	0.06	0.21	0
– lemon meringue	280	45	10	4	13	0.5	260	0.03	0.05	1
– pumpkin	330	53	10.5	6.5	100	2.0	2300	0.06	0.16	0
Pineapple, raw, 1/2 cup	38	9	trace	0.5	11	0.2	90	0.08	0.02	16
– canned, 1 slice and 2 tablespoons syrup	105	26	trace	1	35	0.7	100	0.08	0.02	11
– juice, 4 oz.	70	16	trace	1	18	0.3	100	0.06	0.02	10
Pizza, with cheese, frozen, baked, 1 serving	240	35	7	9	156	0.9	440	0.06	0.20	0
Plum, 1 raw, 2" diameter	30	7	trace	0.7	10	0.3	200	0.04	0.02	3
– canned, heavy syrup, 2 tablespoons juice and 3 plums	100	25	trace	0.5	10	1.3	280	0.03	0.03	1

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Popcorn, popped, 1 cup, plain	50	10.5	trace	2.0	2	0.4	0	0.05	0.02	0
Pork, loin or chop, 1 serving	290	0	23	20	10	2.6	0	0.72	0.21	0
Pork, see also ham										
Potatoes, new, 1 medium, boiled or baked in skin	100	22	trace	2.4	13	0.8	20	0.1	0.05	17
– French fries, 16	310	40	15	4	12	0.8	20	0.07	0.04	11
– 1/2 cup mashed, milk and fat added	115	14	6	2	23	0.5	230	0.08	0.05	8
– chips, 10 large size	110	10	7.4	1	6	0.4	10	0.04	0.02	2
Pudding mix, 1/2 cup, made up, chocolate	210	37	6.6	4.5	147	0.2	200	0.04	0.22	0
Radishes, 4 small	4	0.8	0	0.2	7	0.2	10	.01	trace	5
Raisins, 1 1/2 oz. package	120	28	0.2	1.0	30	1.5	30	0.6	0.03	0
Raspberries, red, raw, 1/2 cup	60	14	trace	1.2	40	0.9	130	0.02	0.07	25
– red, frozen, 1/2 cup	100	25	trace	0.8	30	0.6	80	0.02	0.04	15
Rennet dessert, 1/2 cup	100	13	3.5	3.2	115	trace	150	0.03	0.16	1
Rhubarb, stewed, 1/2 cup	200	49	0.3	1.1	0	0.5	35	0.01	trace	8
Rice, polished, white, cooked in water, 1/2 cup	100	22	trace	2.0	7	0.2	0	0.02	0.01	0

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Rice, puffed cereal, not fortified, 1/2 oz.	52	12	trace	0.8	7	0.2	0	0	0.01	0
Rice Krispies, fortified, 1 oz.	110	25	trace	2	6	4	0	0.6	1.0	0
Rolls, enriched flour, 1 oz.	85	15	1.5	2.5	25	0.7	0	0.07	0.04	0
Rye flour, dark, 100 grams, 3 1/2 oz.	345	66	2	16	55	4.5	0	0.6	0.22	0
Salad dressings, 1 tablespoon, boiled, home-made	25	2	2	0.7	14	trace	80	0.01	0.03	0
– French	60	3	5	0	0	0	0	0	0	0
– mayonnaise	110	0.4	12	0.2	3	0.2	30	0.01	0.01	0
Salmon, canned, 3 oz. (if bones not eaten, much lower in calcium)	135	0	7	18	216	0.8	70	0.02	0.15	0
Sardines, canned, solids only, large serving, 3 oz.	175	1	9	22	330	2.3	190	0.02	0.15	0
Sausages, country style, 3 oz.	340	0	31	15	9	2.3	0	0.2	0.2	0
– pork, 3 links, cooked	470	trace	44	18	7	2.4	0	0.8	0.3	0
– salami, 2 large slices, 2 oz.	255	0	22	14	8	2	0	0.14	0.13	0
– wieners, 2	285	3	24	16	5	2.2	0	0.18	0.21	0
Sherbet, orange, 1/2 cup	135	31	1	1	16	trace	60	0.01	0.03	2

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Sherry, 3 1/2 oz.	160	14	0	trace	0	0	0	0	0	0
Smelts, 4 to 5, fried, 7 oz.	365	0	25	35	700	3.4	0	0.08	0.14	0
Soups, cream, 7 oz., diluted with water	70	7	4	1.5	40	0.4	varies	0.02	0.04	trace
– diluted with milk	130	12	7	5	160	0.6	varies	0.04	0.2	trace
– vegetable, 7 oz., diluted with water	65	11	1.5	2	8	0.3	1200	0.04	0.02	trace
– pea or bean, 7 oz., diluted with water	105	18	2	4.5	35	0.8	280	0.04	0.04	trace
– diluted with milk	170	22	5	8.5	160	0.8	400	0.08	0.2	trace
Soy flour, low fat, 3 1/2 oz.	355	34	6.7	43.4	263	9.1	80	0.83	0.36	0
Spaghetti, cooked, 1/2 cup, not enriched	110	23	0.4	3.4	8	0.4	0	0.01	0.01	0
– enriched	110	23	0.4	3.4	8	0.8	0	0.12	0.08	0
Spinach, cooked, 1/2 cup (its calcium not used by body)	28	3.5	trace	3.0	0	2.2	8000	0.07	0.14	varies
Squash, raw or frozen, cooked, 1/2 cup, summer	25	5	trace	1	14	0.7	170	0.06	0.04	8
– winter	40	9	trace	1	20	0.5	6000	0.05	0.13	7
Strawberries, raw, 1/2 cup	40	8	0.5	0.7	20	1	60	0.03	0.07	60
– canned, 1/2 cup	120	32	trace	0.6	20	1	30	0.02	0.05	35

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Sugar, brown, 1 tablespoon	33	8.3	0	0	7	0.2	0	0	0	0
– white, 1 tablespoon	48	12	0	0	0	0	0	0	0	0
– white, 1 teaspoon	16	4	0	0	0	0	0	0	0	0
Sweet potatoes, 1 small, baked	155	36	1	2	45	1	9000	0.1	0.07	20
– candied	295	60	6	2	45	1	9000	0.1	0.07	17
Syrup, corn, 2 tablespoons	120	30	0	0	18	1.5	0	0	0	0
– maple, 2 tablespoons	100	25	0	0	66	1.2	0	0	0	0
Tangerine, 1	40	9	0.2	0.7	27	0.3	340	0.06	0.02	25
– juice, 1/2 cup	50	11	0.3	1	25	0.3	500	0.07	0.03	25
Tapioca cream or cornstarch pudding, 1/2 cup	135	17	5	5	145	0.1	190	0.04	0.20	1
Tomatoes, 1/3 lb., raw, field-ripened	30	6	trace	1.5	16	0.9	1600	0.08	0.06	30
– raw, imported	30	6	trace	1.5	16	0.9	1600	0.08	0.06	15
– canned, 1/2 cup	24	4.7	trace	1.2	13	0.7	1300	0.07	0.04	20
– juice, 1/2 cup	24	5	trace	1	9	0.5	1250	0.06	0.03	19
Tuna, canned, 3 oz. of solids	160	0	7	25	7	1.2	70	0.04	0.1	0
Turkey, roast, including skin, 3 oz.	225	trace	17	17	20	3.0	0	0.08	0.16	0
Turnips, boiled, 1/2 cup, not mashed	23	5	0.2	0.8	35	0.4	trace	0.04	0.05	22
Veal, roast, 3 oz.	190	0	10	24	10	3.1	0	0.11	0.27	0
Vegetable marrow, see squash, summer										
Vegetable juice cocktail, 3 1/2 oz., unfortified	17	3.5	trace	0.9	24	0.5	700	0.05	0.03	9
Vinegar, 1 tablespoon	2	0.5	0	0	1	trace	0	0	0	0
Waffles, 1 large, from enriched flour	215	28	8	7	145	2.9	270	0.21	0.30	0

	CALORIES	CARBO-HYDRATE gm	FAT gm	PROTEIN gm	CALCIUM mg	IRON mg	VITAMIN A I.U.	THIAMIN mg	RIBOFLAVIN mg	VITAMIN C mg
Wheat flour, 3 1/2 oz. (100 grams), whole grain	333	71	2	13.3	41	2.9	0	0.43	0.16	0
– white, not enriched	364	76	1	10.5	16	0.8	0	0.06	0.05	0
– cake flour, not enriched	364	79	0.8	7.5	17	0.5	0	0.03	0.03	0
– white, enriched	364	76	1	10.5	16	2.9	0	0.43	0.26	0
Wheat flakes, ready-to-eat, fortified, 1 oz.	110	23	0.6	3.0	14	6.0	0	0.6	1.0	0
Wheat germ, 1 tablespoon	19	2.5	0.5	1.3	4	0.4	0	0.1	0.04	0
Wheat, puffed, not fortified, 1/2 oz. (1 cup)	55	12	0.2	1.6	7	0.5	0	0	0.02	0
Wheat, rolled, 3/4 cup cooked, 1 oz. raw	110	23	0.6	3	11	1.0	0	0.12	0.04	0
Wheat, shredded, 1 biscuit	108	22	trace	3.0	14	1.0	0	0.06	0.04	0
Whiskey, 1 1/2 oz.	110	0	0	0	0	0	0	0	0	0
Wieners, see sausages										
Wine, table, 3 1/2 oz.	85	4	0	trace	0	0	0	0	0	0
Yoghurt, 1/2 cup using partly skimmed milk	50	5	1.7	3.4	120	trace	140	0.04	0.18	0

REFERENCE

NUTRITION BOOKS

The more elementary books are listed first.

Feast and Famine: the wonderful world of food, John Boyd Orr, London (England): Rathbone Books, (1957); also published by Garden City Books, New York, (1958), as *The Wonderful World of Food: the substance of life.*

A history of food and its effect on mankind, with many colored illustrations.

Food and its Functions, A. G. Cameron, (1964), available from The Macmillan Company of Canada Limited, Toronto.

A British book; their eating habits differ from ours in some ways.

Food Customs of New Canadians, Toronto Nutrition Committee, P.O. Box 744, Terminal A, Toronto 1, 1967.

Explains their food customs in their country of origin and in Toronto.

Reliable and Unreliable Nutrition References, Toronto Nutrition Committee, P.O. Box 744, Terminal A, Toronto 1, 1973.

Pioneer Days in Upper Canada, E. C. Guillet, Toronto: University of Toronto Press. (paperback)

Food Science and Technology, Magnus Pyke, (1964), available from Longmans Canada Limited, Toronto.

A well illustrated British book on food processing. Most of the methods described are similar to those used here.

The Great Nutrition Puzzle, Dorothy Callahan and Alma Smith Payne, Charles Scribner's Sons, (1956).

An interesting and simple history of the important facts about nutrition.

Food Becomes You, Ruth M. Leverton, New York: Doubleday & Company, Inc., (1961). (also available as a Dolphin paperback)

A very readable, practical book, especially good on the prevention of overweight.

Food, Facts and Fallacies, A. G. Cameron, London: Faber and Faber Ltd., (1971).

A British book, non-technical, written for the general public, which describes modern food practices accurately and interestingly.

A Chemical Approach to Food and Nutrition, B. A. Fox and A. G. Cameron, (1961), available from Clarke, Irwin and Company Limited, Toronto.

A British book written in simple terms by a chemist.

Eating for Good Health, F. J. Stare, (1964), available from Doubleday Publishers, Toronto.

A collection of newspaper and magazine articles by an American expert.

Let's Talk About Food, edited by P. L. White, (1970), paperback edition available from American Medical Association Circulation Department, 534 N. Dearborn Street, Chicago, Illinois.

A large series of interesting questions and answers about food. Remember that an American quart is about equal to $1^1/_2$ pints, Canadian measure, and that the Americans recommend more of most of the nutrients.

From Cell to Test Tube, R. W. Chambers and A. S. Payne, (1961), available from Longmans Canada Limited, Toronto.

A simple book on the chemistry of living creatures, including human beings.

Second Book of Food and Nutrition, W. Matthews and D. Wells, (1971), available from "Home Economics and Domestic Subjects Review," St. James House, Kensington Square, London W8.

A British book, moderately advanced, containing information on such items as the nutrients, convenience foods, food additives; not all of the information is applicable here.

Food Hygiene and Food Hazards, A. B. Christie and Mary C. Christie, London: Faber and Faber, (1971).

A lively, accurate and easily understood British book on how to keep food safe from harmful bacteria by a physician and his daughter.

Food Science, Gordon G. Birch, M. Spencer, and A. G. Cameron, Toronto: Pergamon Press, (1972).

A reasonably non-technical British book, mostly on the processing of food. It contains a great deal of interesting information.

Chemical Additives in Food, edited by R. W. L. Goodwin, London: J. and A. Churchill, (1967).
The introductory chapter and those on food flavors, colors, and packaging are informative. The remainder of the book is technical.
Food For Us All, "The Yearbook of Agriculture", (1969), available from The Public Documents Distribution Centre, 5801 Tabor Avenue, Philadelphia, Pa., 19120.
A well illustrated, well written 360-page book on the production, distribution, processing, relative costs and nutrient values of most foods. Some of our standards, measures, and products are different but much of this book is of use to us.
Nutrition Science and You, Olaf Mickelsen, Vista of Science Paperback #10, National Science Teachers' Association, available from Scholastic Book Services, Richmond Hill.
A moderately technical 127-page book on the science of nutrition by an American authority.
Vitamins, edited by M. Stein, University of Nottingham Seminar, Edinburgh: Churchill Livingstone, (1971).
Some sections are much too advanced, others are suitable. The chapter on "The Fate of Vitamins in Food Processing Operations" is particularly informative.
Food: fact and folklore, Alice Jenner, Toronto: McClelland and Stewart, (1973).
Comments and searching questions by the author on quotations from various authors on a wide range of topics related to food, including the effects of social, cultural and religious differences. Parts of this book would interest students at this level.
Nutrition for Today, Elizabeth Chant Robertson, Toronto: McClelland and Stewart, (1968).
Senior high school level, demanding little knowledge of chemistry. Note that food manufacturers are now fortifying more of their products than in 1968. Read labels.
Nutrition and Physical Fitness, L. J. Bogert, G. M. Briggs, and D. H. Calloway, Toronto: W. B. Saunders Co. Canada Ltd., (1965).
A large, only moderately technical American text, written in an interesting and practical way with good diagrams.
The Science of Nutrition, M. T. Arlin, Toronto: Collier-Macmillan Canada Ltd., (1972).
An elementary college level text, particularly simple and clear when discussing the body's use of the various nutrients.
Introductory Nutrition, H. A. Guthrie, Toronto: C. V. Mosby, (1971).
Junior college level, well-written American text.
Food Science, Helen Charley, New York: Ronald Press, (1970).
An American college text which explains how to cook all kinds of food and the nutritional advantages of some ways over others.
Food in England, Dorothy Hartley, London: Macdonald, (1954).
A comprehensive survey of English food and methods of cooking through the ages.
A very interesting, nicely illustrated guide for students interested in the social history of food in England.

FOOD TABLES

A Table of Food Values Recommended for Use in Canada, (1963), available from Information Canada, 221 Yonge Street, Toronto.
Contains few analyses on cooked foods.
Nutrient Values of some Common Foods, available to your teacher from a public health nurse.
A small pamphlet which has some of the tables from the above listed books and some additional analyses of many cooked foods.
Composition of Foods — Raw, Processed, Prepared, Watt and Merrill, revised Agriculture Handbook #8, (1963), available from Public Documents Distribution Centre, 5801 Tabor Avenue, Philadelphia, Pa. 19120.
A very complete set of tables showing nutrients in raw, cooked, and processed foods per 100 gram and per one pound portion.
Nutritive Value of Foods, Home and Garden Bulletin, #72, (1970), available from Public Documents Distribution Centre, 5801 Tabor Avenue, Philadelphia, Pa. 19120.
Tables of nutrtive values for common household measures of foods listed in Agriculture Handbook #8.

Food Values of Portions Commonly Used, Church and Church, (1970), available from J. B. Lippincott Co. of Canada Ltd., Toronto.
Very complete American food tables both for usual portions and per pound.

COOK BOOKS

Canadian Cook Book, N. L. Pattinson, revised by H. Wattie and E. Donaldson, Toronto: The Ryerson Press, (1961).
A very popular and useful book.
The Joy of Cooking, I. S. Rombauer and M. R. Becker, available from McClelland and Stewart, Toronto.
A larger American book, including more gourmet recipes.
The Laura Secord Canadian Cook Book, Canadian Home Economics Association, Toronto: McClelland and Stewart, (1966).
Features many recipes that are popular and distinctive in the various parts of Canada.
National Cookery Books by various authors, London: Andre Deutsch, publisher.
These include books on Austrian, Chinese, German, Hungarian, Indian, Italian, Jewish, Middle Eastern, and Scottish cooking.
Indian Recipes, Bernard Assiniwi, (Toronto: The Copp Clark Publishing Company, 1972).
Survival in the Bush, Bernard Assiniwi, (Toronto: The Copp Clark Publishing Company, 1972).
The Canadian Home Cook Book (Toronto: Hunter, Rose and Company, 1877).
My Life with the Eskimo, Vilhjalmur Stefansson, (New York, N.Y.: Collier Books, The Macmillan Company, 1913).
A Journey to the Northern Ocean, Samuel Hearne, edited by Richard Glover (Toronto: The MacMillan Company of Canada Limited, 1958).
Food in History, Reay Tannahill, (New York, N.Y.: Stein and Day/Publishers, 1973).
The Canadiana Cookbook, Jehane Benoit, (Toronto: Pagurian Press Limited, 1970).
Out of Old Nova Scotia Kitchens, Marie Nightingale, (New York, N.Y.: Charles Scribner's Sons, 1971).

PAMPHLETS

Many different pamphlets are published by both government and commercial agencies. Only a few suggestions are listed below.

Departments of Health, federal and provincial — the public health nurse, teacher, or school librarian will have a descriptive list of publications produced by these government agencies.

Ontario Ministry of Agriculture and Food, Parliament Buildings, Toronto — this ministry has published many interesting and useful booklets on individual fruits and vegetables, salads, cheese, and other foods. Two larger booklets, *Let's Cook It Right* and *Your Money's Worth in Food* are full of valuable information. The Information Branch of this Ministry has a catalogue of its published materials.

Meat Packers Council of Canada, Islington, Ontario.

Poultry Products Institute of Canada, Inc., Toronto.

Canada Department of Fisheries, Information Division, Ottawa, and many others.

FILMS

It is suggested that teachers check with the audio-visual service of their Boards of Education regarding the films that are available or can be obtained. The brief comments following the film titles listed below are based on information obtained from home economists on the staff of the Milk Foundations.

. . . *AND EVERYTHING NICE* (1966), 16 mm color/sound, 23 minutes
This film is designed to encourage young teenager girls to think about what they eat, how they look, and how they act. Student folder and snack chart available. The styles are now out-dated, but the information is still accurate.

FOOD, THE COLOR OF LIFE (1965), 16 mm color/sound, 22½ minutes
A fairly advanced talk on good nutrition and buying habits. Presents nutrition as part of a lifetime experience in good taste and intelligent living, and shows how food can be selected in line with the latest nutrition information.

FOOD, ENERGY AND YOU (1968), 16 mm color/sound, 20 minutes
Animated scenes show the basic process by which plants store energy. When we eat foods — as plants, or as meat from animals which have eaten plants — the process of photosynthesis is reversed in our bodies, supplying us with the energy we require. Explains how the body controls the use of energy stored in food, and shows the body mechanisms which release and use that energy.
An excellent film. A simulated laboratory system is used to illustrate "input" and "output" of energy.

FOOD FOR LIFE (1968), 16 mm color/sound, 22½ minutes
Compares the food practices and problems of four malnourished teenagers from diverse backgrounds. The concept that malnutrition is not always the result of lack of food is well presented. Of particular interest to teenagers. Also useful for weight-control groups.

HOW A HAMBURGER TURNS INTO YOU (1968), 16 mm color/sound, 19 minutes
Twelve-year-old boy eats a hamburger and learns how his body uses protein. A well-presented film, with detailed explanation of the body's manufacture of cells. Most experts state that only 20 amino acids are found in foods, rather than the twenty-two mentioned in this film.

MENU (1968), 16 mm color/sound, 22 minutes
Shows the importance of good nutrition for all members of the family. A fascinating nutrition experiment using a litter of pups at the R.C.M.P. training centre at Red Deer, Alberta, highlights this film. A colorful, modern, and informative approach to the importance of well-balanced meals for each age and activity group in the family. Prepared under the supervision of the Department of National Health and Welfare, Ottawa.

OVER THE PLATE, 16 mm color/sound, 16 minutes
Shows that co-ordination, good sportsmanship, and good health habits are essential to help a boy become a big league baseball player. Although this film is definitely "American baseball oriented," it has appeal for Canadian boys and girls. Nutrition information is up-to-date, but film is somewhat dated.

WHAT'S GOOD TO EAT? (1968), 16 mm color/sound, 17½ minutes
A 12-year-old boy learns how to choose foods from the main food groups to obtain the nutrients he needs. We see how the body uses nutrients, and how a food guide provides a reliable pattern for daily enjoyable eating. Question and answer technique is good.

NUTRITIONAL QUACKERY, 20 minutes, color/sound
Check if your audio-visual centre has it. Purchase from International Telefilm Enterprises, 221 Victoria Street, Toronto.
This film is built around a health quack expounding four favourite myths: diet-heart disease myth, all diseases are due to faulty diets, the soil depletion myth, and the overprocessing myth. Film uses technique of one-man lecture style, making it a little dull, but information good on chemical fertilizers, pesticides, food additives, and modern method of food processing.

FOOD OR FAMINE, 16 mm color/sound, 42 minutes
Check with Shell (Canada) Limited re borrowing this film.
A general study of the problems of world population and inadequate food supplies, prepared to support the Freedom from Hunger Campaign. Suitable for all adult groups, but not for young children. An excellent, well presented, informative film.

FILMSTRIPS

FOOD, FUEL FOR THE BODY, 35 mm , 41 frames, with captions, color, teachers' guide available; distributed by F.O.M. Filmstrips of Canada, Suite 301, 333 Metropolitan Blvd. E., Montreal 38, P.Q.; $6.00 per copy.
Deals with the body's use of food. Shows the complete digestive system, the blood transport system, and how each nutrient is utilized in the body. Also outlines an experiment to illustrate why saliva turns starch into sugar. Very good material for study of digestion.

HEADSTART ON HOMEMAKING (1968), 35 mm , 58 frames, color commentary, idea guide, and recipes available; distributed by Mary Blake, Department HH-68, Carnation Company Ltd., Aylmer, Ontario; complimentary to teachers.

Designed to spark interest in the art of homemaking among young high school students. "Home is the social centre formed by a family living together" — this theme is demonstrated as the student is shown not only the responsibilities involved, but the rewards earned through efficient planning and careful food preparation and serving.

SPENDING YOUR FOOD DOLLARS, 35 mm , 73 frames, with captions, color, study guide available, distributed by Money Management Institute, Household Finance Corporation of Canada, 85 Bloor Street East, Toronto 5, Ontario; $1.75 per copy.

Shows how to budget food money; plan nutritious meals and snacks; buy fresh and processed foods; store foods properly; prepare attractive, nourishing, and appetizing meals. Emphasizes the challenges and rewards of managing food dollars skillfully. Nutrition facts based on "Canada's Food Guide." Well planned and presented. Suitable for all socio-economic groups but most useful if accompanied by a speaker and discussion.

YOUR FOOD AND DIGESTION, 35 mm , 68 frames, with captions, color, distributed by Scott Graphics Limited, 99 Advance Road, Toronto 18, Ontario; $7.00 per copy.

Shows how the human body works and why good health habits are important. The first unit deals with types of foods and how each type helps build strong bodies. The second and third units explain and illustrate digestion and good health habits. Good basic information on body's use of food, and importance of choosing proper kinds of food.

YOUR FOOD — CHANCE OR CHOICE? (1970), 35 mm , 106 frames, color, sound on separate record, teachers' guide available, prepared and distributed by National Dairy Council, 111 North Canal Street, Chicago, Illinois, U.S.A. 60606; $5.00 (U.S.A.) per set (filmstrip and record).

Directed particularly to young teens, but suitable for all adolescents and young adults, the filmstrip has 4 objectives: to increase the teenager's awareness of his or her daily food choices; to offer a reliable guide for making good daily food choices; to introduce decision-making principles, and show how they apply to food selection; to involve the teenager in analyzing why he (or she) makes the food choices he does, and in learning whether or not they are nutritionally adequate. Excellent, up-to-date, and "in tune" with groups to whom it is directed. Will be most useful if used several times with same group, and will require much advance preparation for most effective use.

HOW FOOD BECOMES YOU (1964), 35 mm , 56 frames, color, teachers' guide and narration available, distributed by National Dairy Council, 111 North Canal Street, Chicago, Illinois, U.S.A. 60606; $2.00 (U.S.A.) per copy.

Designed to help young people discover what happens to food in their bodies and why a variety of foods is important for good nutrition. Follows the intellectual development of the child, as it discusses individual differences in height, weight, and body size in relation to the use of nutrients from food to build the different kinds of cells in the body. Also deals with body's use of energy from food. Well presented, but references to American nutrient allowances can be interpreted in terms of Canadian standards. Should be accompanied by discussion.

FOOD FOR GOOD HEALTH, Series #8420, 48 frames, color, distributed by Encyclopaedia Britannica Corporation, 151 Bloor Street West, Toronto 5, Ontario. $6.00 per copy.

Shows the importance of food, how plants and animals get their food, and how human beings can be sure of getting the foods that are good for them. Excellent, well presented and illustrated.

KINDS OF FOOD, Series #8420, 48 frames, color, distributed by Encyclopaedia Britannica Corporation, 151 Bloor Street West, Toronto 5, Ontario. $6.00 per copy.

Illustrates that there are many different kinds of foods from animals and plants and that many foods must be changed before we can eat them. Same series as "Food for Good Health", also an excellent educative filmstrip.

FOODS AND NUTRITION, 65 frames, black and white, distributed by Encyclopaedia Britannica Corporation, 151 Bloor Street West, Toronto 5, Ontario. $3.00 per copy.

One of a series entitled "The Human Body." Illustrates body functions in the area of health and nutrition. Actual laboratory work, animal experiments, and charts help the student understand the importance of good food for health.

KEEPING FOOD SAFE TO EAT, 44 frames, color, distributed by F.O.M. Filmstrips of Canada, Suite 301, 333 Metropolitan Blvd. East, Montreal 38, P.Q., $6.00 per copy.
Shows principal methods of food preservation to prevent spoilage.

SLIDES

FOOD MYSTIQUE SLIDE SERIES. A series of 28 separate, 35 mm slides obtainable from Visual Educational Centre, 115 Berkeley St., Toronto, $12.60 per set with descriptive folder; with tape cassette, $18.60.
Topics such as food additives, pesticides, "wonder foods," the reliability of books written by self-styled nutrition authorities and government laws on foods are discussed in a series of cartoon slides. Prepared by Health Protection Branch of National Department of Health and Welfare.

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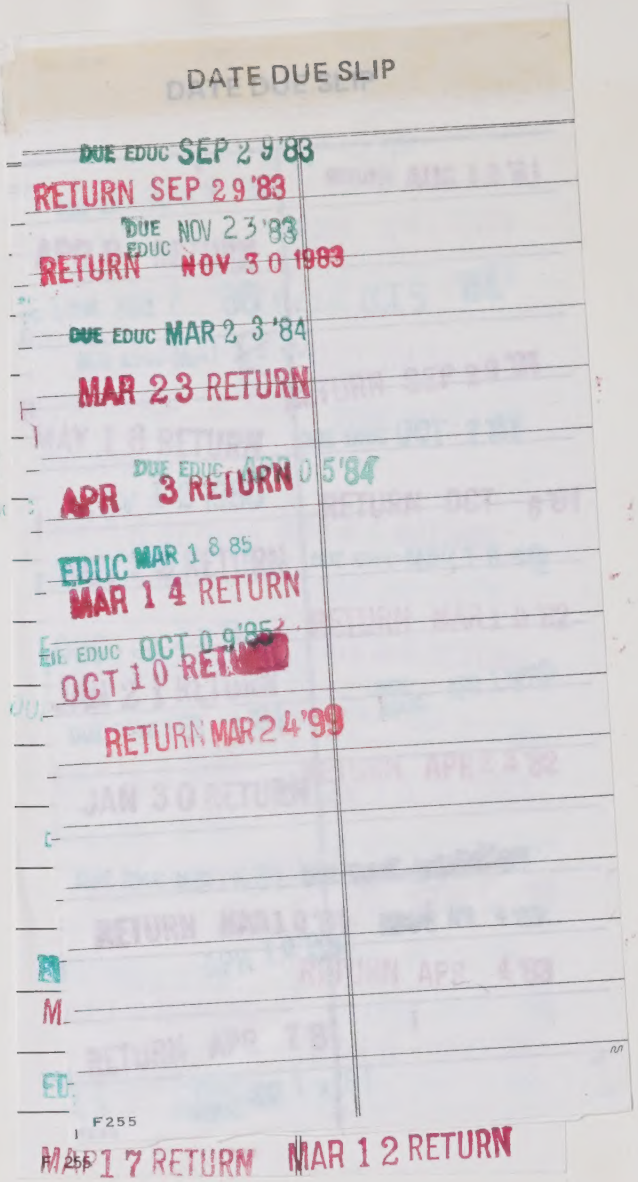
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